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THE AMERICAN
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EDITORIAL

TÉKEL.*

A bill (House-Bill No. 348) prepared for the legislature now in session in Pennsylvania, proposed "That no laboratory procedure for the diagnosis or treatment of human disease shall be performed or reported by persons who have not a license to practice Medicine and Surgery in the State of Pennsylvania, except under the direct supervision and upon the personal responsibility of a physician duly licensed in the State of Pennsylvania." Clauses were also written into the bill giving power to inspect laboratories and to suspend their operation, to a Division in the Board of Medical Education and Licensure, created by the proposed bill.

Some of the possibilities of this bill may be clearly suggested, without prejudice, by an analogy. Suppose a State Bar Association should have a bill passed so that no laboratory procedure for the detection and punishment of (human) crime shall be performed or reported by persons who have not been admitted to some county Bar within the Commonwealth, except under the direct supervision and upon the personal responsibility of a lawyer duly qualified to practice, . . . etc. Since the Food & Drugs Act is a criminal act, no pharmacist in said State could assay his drugs, or go through with any laboratory procedure whatsoever that might be used by someone else in the detection and punishment of offenders against the Food and Drugs Act. Any laboratory procedure related ever so remotely to the detection and punishment of crime, and used only once for the detection and punishment of crime to every nine hundred and ninety-nine thousand nine hundred and ninety-nine

*See Daniel V, 27.

times it was ordinarily used for other purposes, would nevertheless be forbidden. Chemists would be forced to conduct their procedures in the larger number of instances, only in a lawyer's laboratory and under a lawyer's direct supervision. The layman would not be allowed to use the blow-pipe and charcoal furnished gratis by the advertising department of the manufacturer of "Pure White Lead" except under the direct supervision and upon the personal responsibility of a lawyer, for by using the blow-pipe and charcoal the layman would be performing a laboratory procedure for the detection and punishment of adulteration. As to the legal supervisors, the chemist or pharmacist might be so located that the only lawyer who could take charge of his laboratory would prove to be a lawyer who had spent a long life settling the estates of the dead, or who was a corporation lawyer, or who had specialized in real estate, and who would honestly have to admit that he had never been in a criminal court to practice and that he had no further knowledge of toxicology and of the sciences upon which it rests than the knowledge he had gained in the few months given to it and to the exact sciences when he was a college student many years before.

It is not necessary for the writer to pursue this analogy further; the reader may more profitably do so for himself and thus elucidate the potentialities of such a bill toward his own individual interests, and toward those of the other individuals in the community in which he lives.

When the existence of such a proposed bill became known, the matter was taken up by the Philadelphia sections of the American Pharmaceutical Association and of the American Chemical Society. By the representatives of these organizations it was made evident that the diagnosis of disease and the practice of medicine (treatment of disease) by unauthorized persons were already unlawful in Pennsylvania and were adequately penalized under the Act of 1911, and that the broad wording of the proposed bill was such as to be needlessly inimical to pharmacists, chemists, institutions of learning having laboratory courses, and manufacturing concerns making laboratory products. The bill was accordingly dropped.

But all who are able to appreciate laboratory procedures, their use and abuse, should read in this incident the new post-War demand for honesty and integrity in service, and the new post-War threat against imposition and fraud. In proportion as the laboratory

serves the public, the ethics of the laboratory are as important to society as the ethics of any other public or quasi-public activity. The day is near when these ethics will be more clearly defined. It will not suffice to bedeck deception with the laboratory apron of science. Pretense and quackery will be stripped and exposed in public places, and their sponsors fined and imprisoned.

D. W. H.

SELECTED EDITORIAL

THE SUCCESS OF A FAILURE.

"No," said the lumber dealer, "your boy is good for nothing in my business. In fact, he is the most miserable failure I have ever seen and will never amount to anything."

"Well," replied the disappointed father, "since Emil is too stupid to make a living in lumber I suppose I might as well let him go to college as he wants to."

So Emil Fischer went to Bonn University to study chemistry. Here he was recognized as one of the most brilliant and industrious students in the laboratory, and by the time he was twenty-three he had discovered a key that unlocked one of the most mysterious processes of life. This key was a coal tar compound known to chemists as "phenyl hydrazine." It was both fortunate and fatal to Fischer. It made him one of the most famous chemists in the world and it brought him disease and death. For the fumes of it are poisonous and constant working with it ruined his health.

But nothing could impair his energy or dampen his ardor. For after he got free from the lumber business and started on his own track, he pursued it for forty-five years without interruption or diversion. As one of his colleagues said at the time of his death in 1919:

"A life is ended in which there was no failure, no let-up in restless activity, no long groping about for something to accomplish. After one quick, clear vision of the goal the path led straight to its accomplishment, a chain of brilliant successes."

How Emil Fischer himself looked at his life work is shown by these words:

"Still more enticing to some, among whom I include myself, is the hope to climb up out of the valleys to those passes seen afar off, which lead to vast and as yet unexplored countries."

The unexplored country that he had in view and ventured in was no less than the formative functions of vegetable and animal life. With the aid of phenyl hydrazine he was able to solve the secret of sugar. Not content with finding out how sugar may be made by the plant he learned to make it himself. He found it possible to produce in the laboratory many more kinds of sugar than can be discovered in nature. Finally he worked out a process by which he could start with plain coal and water and build up a series of edible sugars.

Then Fischer tackled a still more difficult problem in nutrition, the constitution of the proteins. These form an essential part of our food since they contain the nitrogen necessary to all life. It used to be thought that the proteins, whether of vegetable origin, like the gluten of wheat, or of animal origin, like the casein of milk, were much alike and that it made little difference which of the many we got in our food. But Fischer showed that a protein molecule was made up of a long chain of carbon and nitrogen compounds and that the links were of very different kinds. Finally, he made a sort of artificial protein, what might be called a laboratory beefsteak, but whether it was good to eat or not could not be determined since there was so little of it and it cost so much. He spent $250 for the material alone, to say nothing of his time, in constructing this compound, so, as he said, "it has not yet made its appearance on the dining table."

There is little prospect that the food of the future will come from the laboratory instead of the field. Even a professor of chemistry cannot live as cheaply as a cornstalk. But the work of Fischer on the sugars and proteins has already been of immense value to the world in leading to the newer knowledge of nutrition, which is already being applied to the feeding of stock and people.

As Sir Henry Roscoe, professor of chemistry at Manchester, said of Fischer when he was awarded the Faraday medal: "His name has the sweetest of tastes in the mouth of every chemist." Fischer conquered for chemistry a field formerly claimed by biology. He brought within the reach of experimentation what had been regarded as the exclusive province of vital processes.

So it seems that a man may be a miserable failure as a lumber merchant and yet make a success of something else. The problem of education is to fit square pegs into round holes without whittling them down too much in the process of schooling.

Dr. E. E. Slosson.

Science Service,
Washington, D. C.

ORIGINAL ARTICLES

THE ROMANCE OF SPICES.

Charles H. LaWall, Ph. M., Sc. D.

Chemist of Food Bureau, Pennsylvania Department of Agriculture; Dean and Professor of Pharmacy, Philadelphia College of Pharmacy and Science.

"Nose, nose, nose, nose!
And who gave thee that jolly red nose?
Sinamint, ginger, nutmegs and cloves;
And that gave me my jolly red nose."

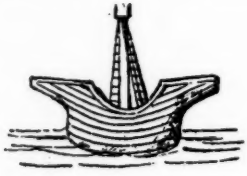
The foregoing doggerel from a sixteen century author is proof, not only of the unchangeableness of human nature in its efforts to avoid responsibility, but it brings into prominence a group of spices which have been the cause of centuries of bloodshed, of great maritime discoveries, of changing boundaries and the rise and fall of empires.

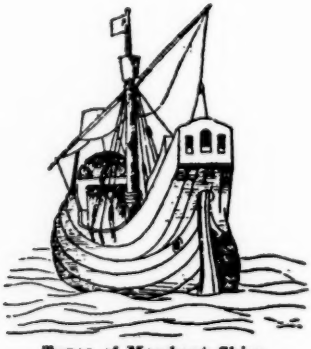
It is more than probable that gin rather than ginger was responsible for the roseate condition referred to, but that has nothing to do with the present lecture.

When and by whom the first spices were employed to give zest and flavor to food will ever remain an unsolved mystery, for their use antedates all historical and traditional records. In all climes and in all ages man seems to have needed some pungent or aromatic food accessory. The substances now included in the list of spices is surprisingly large, comprising many vegetable products and a number of aromatic herbs.

*One of a Series of Popular Lectures delivered at the Philadelphia College of Pharmacy and Science, 1922-1923.

terious East, where civilization's cradle was rocked by the stern hand of destiny, have come down to us through the ages, set apart





Types of Merchant Ships.

from the others by the human interest bound up in their story—a story which has never been and can never be fully told. A story

NOTE.—The illustrations of ancient vessels are from "The Romance of Commerce," by Selfridge; by permission of Dodd, Mead & Co., New York, the owners of the copyright.

A small group of these, nearly all of them products of the mys- in which we find "weaving through all the poor details and home-spun warp of circumstance a golden woof thread of romance."

Back to far Cathay we go for the glimmering of the earlier chapters of this story, back to the jungle-buried evidences of long-forgotten civilizations of the Orient, for it was out of the East that there were transported, first by junk and caravan, later by felucca, galleon, caravel and carrack, then by merchantman and clipper, and now by ungraceful freighter, these aromatic and pungent wares that have left their indisputable traces on the politics and geography of the world.

The very names of the earlier kingdoms and cities are no longer known to us. Even the poets can give us only glimpses through the medium of dreams, as we remember Coleridge's sonorous lines of that former ruler of Cathay:

> "In Xanadu did Kubla Khan
> A stately pleasure dome decree;
> Where Alph, the sacred river, ran
> Through caverns measureless to man
> Down to a sunless sea."

Kingdom succeeded kingdom, empire succeeded empire, and still we are able to discern only fragments of the tale. Babylon was eclipsed by Tyre and Sidon. Alexandria, Syracuse, Carthage—all bowed to Rome. Constantinople's greatness was eclipsed by that of Venice, which was in time supplanted by Lisbon, and this in turn gave way to Amsterdam and London as centres of the spice traffic.

Tithes of anise and cumin are referred to in biblical times, although these were not counted among the precious spices. In Egypt, caravans from before the days of Tut-Ankh-Amen had traversed the burning sands with their spice laden camels. Joseph's jealous brethren sold him to such a caravan and the effect upon the history of Egypt was of great moment.

When Alaric the Goth conquered Rome in 408 B. C., one of the ransoms asked by him was 3000 pounds of pepper, then worth more than its weight in gold. In the time of Augustus Caesar, one of the records reads: "Unto the East, under the rising sun, to fetch rough pepper and pale cumin seed for Roman wares."

Prior to the thirteenth century all trade routes from the Orient were overland and heavy toll was taken by those who occupied the

gateway of the then civilized world. Moorish merchants in the thirteenth century, brought far Eastern products by way of the Arabian and Red Seas to the port of Suez, thence by caravan to the Nile and down the Nile to Alexandria, where, as has been aptly stated, "East touched West and the Christian and Mohammedan worlds met." Balsun, on the Persian Gulf, and Mocha, on the Red Sea, were caravan starting points from the earliest period of which any record exists.

In the beginning of the fourteenth century Edward of England had granted privileges to merchants under the "Charta Mercatoria," in which were mentioned "spices, gross spices or groceries, as well as minor spices." A little later in this same century the "Fraternity of Pepperers" changed its name to the "Guild of Grocers," and among other objects depicted on the coat of arms were six cloves. The grocers of this day were the merchant adventurers who sold in large lots, while the pepperers sold in small parcels.

In the early part of the fifteenth century we begin to get a connected story, so we shall take this as our starting point. Venice, which had been founded in the fifth century by the fleeing hordes of Attila the Hun, had gradually acquired the commercial supremacy of the Mediterranean, her only rival being Genoa. When, in June of 1380, the Genoese fleet was destroyed by that of the Venetians, she entered into what is now recognized as the greatest century of her development.

Marco Polo, in the previous century, had helped to lay the foundations of her power by his extensive travels in the Orient. It is quite possible that his valuable knowledge would not have been made available to his contemporaries had he not taken advantage of a year's detention as a prisoner by the Genoese, in 1298, to dictate his marvelous experiences to a fellow prisoner, who later gave them to the world.

Venice was built upon the sea; thrived and was dependent upon the sea. The later crusaders took advantage of her position and used Venice as the embarkation point, thus giving her a prominence which was used to great advantage in the development of her commerce. The mercantile and warehouse records of these early centuries show the traffic in pepper, cinnamon, nutmeg, mace, cloves and ginger, to have been worthy of special mention, and this comprises the list

of the more precious of spices, and those whose particular history we are about to follow.

At her peak of affluence it is estimated that the Venetian traffic in spices alone amounted to over ten million dollars annually—a notable sum for one small city in those days. At this period there were afloat upon the Mediterranean and up along the west coast of Europe to London and Bruges, more than 300 great galleys or argosies (named from Ragusa, a nearby Dalmatian seaport where these vessels were built) and for their protection she owned forty-five war galleys.

The Rialto was then the centre of the commercial life of Venice. This is a mercantile exchange built upon an island of that name. Here gathered the money lenders and merchants of Lombardy, Navarre, Tuscany, Bavaria, Hungary, Florence, Catalonia, Germany, Brabant, England and Flanders. Here Shakespeare makes Shylock hear the news of Antonio's ventures. Rich man, poor man, beggar man, thief, doctor, lawyer, merchant chief—all commingled in enterprises of great speculative possibilities.

The foreign merchant in these days was subjected to humiliating and severe restrictions. He was required to live in a warehouse-hotel, constantly under the supervision of officials who saw to it that neither the State nor local merchants were cheated. He might trade with none but Venetians and must dispose of his entire stock, even if at a loss.

The merchandise to and from Germany was transported over Alpine snows by heavily guarded pack trains. Western Europe and England were served yearly by fleets of galleys—Flanders galleys, they were called. Each was rowed by 180 oarsmen, protected by archers. Among the ports of call were Pola, Corfu, Alicante, Almeria, Cadiz and Lisbon. The terminus was Bruges, where merchants of the Hanseatic League and of the Fugger's, took charge of further distribution. Some few galleys reached London or Southampton.

The wrecking of a richly laden argosy off the coast of France in 1578, led to the declaration by the Venetians that they would no longer send their vessels into such dangerous waters and this led indirectly to the establishment of the far-famed Levant Company of London.

Venice was a typical merchant republic. Her young patricians

were sent on Flanders voyages to serve their apprenticeship to commerce. The grateful acknowledgment which the Venetians accorded to the sea as the giver of prosperity was attested by the famous annual ceremony of the symbolic marriage of the Doge to the Adriatic, a golden circlet being tossed into the sea with these words: "We espouse thee, O sea, as our bride and queen." Some few of San Marco's sons wandered far afield and even penetrated Muscovy with their rich consignments of merchandise and spices.

Spices were so precious and so expensive in Europe in the fourteenth century, due to the long overland caravan routes and the many who took toll in profit or tribute on the way that the thought of western merchants reaching the Oriental source of supply and thus reaping the entire profit, became an obsession which lasted until the problem was finally solved by Vasco da Gama in 1498.

We are apt to look upon these early navigators as imbued with the spirit of adventure alone, but their heroism had ever a background of selfish interest, and the voyages of Columbus, da Gama, Magellan, the Cabots, Vespucci, Sir Humphrey Gilbert, Drake and others had for their primary object the discovery of a direct route to the Spice Islands and the control of the trade for the sovereign who financed the expedition. The fabulous northwest passage and its mythical northeast counterpart were but possible means to a selfish end. There was an unverified tradition that the Phœnecians, whose keels had traversed the Mediterranean 2000 years before Christ, had discovered an all-sea route to the Indies by sailing westward out of the Strait of Gibraltar.

The Portuguese, those intrepid sons of Lusitania, had long been noted for their maritime courage when Venice commenced to dominate the commerce of Western Europe. Early in the fifteenth century, Prince Henry, the third son of King John of Portugal, had dreamed of discovering a water route to the Indies. Prince John, returning from a visit to Venice, brought his brother Henry a copy of the complete works and maps of Marco Polo, then over a century old, but never put to practical use. This served as an inspiration to his dreams and thus the Venetians contributed unwittingly to their own downfall by permitting the dissemination of this information.

In furtherance of his ambition, Henry established headquarters upon an estate on Cape St. Vincent, the southernmost point

of Western Europe. Here he surrounded himself with navigators, cartographers and mathematicians. Although he never made a voyage himself, he sent out an expedition each year for more than forty years, beginning in 1418.

At the time of his death in 1460 much had been accomplished, for the Cape Verde Islands, the Azores and the Canary Islands had been discovered, and more than one thousand miles of African coast line had been charted and explored.

Pope Martin V, in order to aid this laudable undertaking, had granted plenary indulgence to all who perished in exploration or conquest, and had, in addition, promised that the Portuguese should retain all the lands that might be discovered.

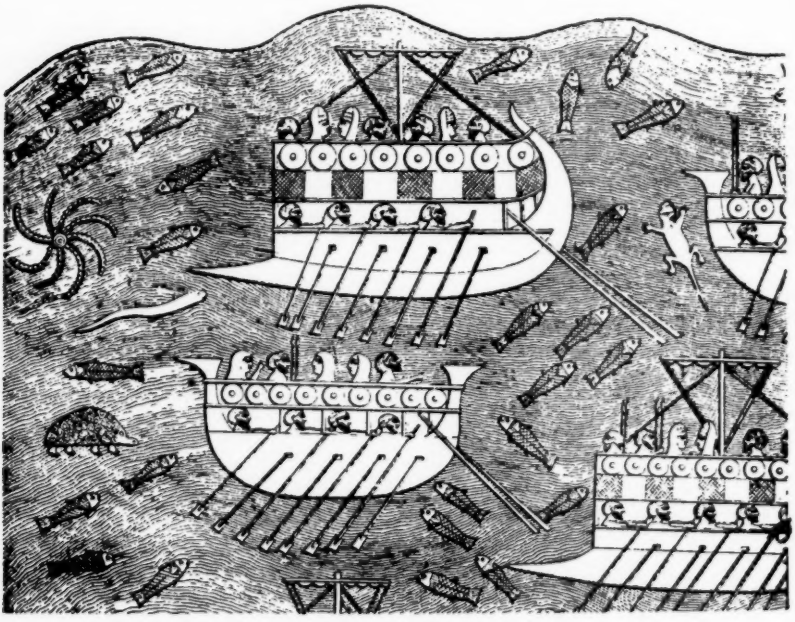
One of the less important spices, known as the Grains of Paradise, or Melegueta Pepper, which had hitherto been brought overland from tropical Western Africa, became the monopoly of the Portuguese crown, due to the expeditions sent out by Prince Henry, and the interest in the search for the Indies became intensified.

In 1486 an expedition sent out by King John, commanded by Bartholomeu Dias, a gentleman of the royal household, reached the southernmost point of the African continent and, being buffeted severely by the storms prevalent in this neighborhood, Dias named it Cabo Tormentosa, but upon his return, King John, seeing the importance of this discovery to future voyages, rechristened it Cabo Bona Speranza, or Cape of Good Hope, which name it still retains.

About this same period King John sent overland emissaries to the Orient to bring back information concerning a possible sea route and facts regarding the spices themselves, for their actual origin had been shrouded in much mystery. His first messenger failed through a lack of knowledge of the Arabic language, for it will be remembered that it was the Moorish merchants who controlled the land and sea routes east of Suez. Two other emissaries, Pedro Covilham and Alfonso de Payva, were then sent out with orders to trace the Venetian commerce in spices through its Moorish contacts to the original sources themselves.

The land of Prester John was also to be located and visited. This fabulous Christian monarch was believed by some to have established a powerful empire, somewhere beyond the desert. Marvelous tales were told of his power and wealth and letters purporting to have been sent by him to Western rulers were in existence.

Covilham and Payva went to Alexandria, thence to Cairo and by caravan to the Red Sea, where they met Moorish traders newly arrived with spices from India. At Aden they separated. Covilham went with a Moorish merchant ship to Calicut on the Malabar coast of southwestern India, being the first Portuguese to voyage on the Indian Ocean. Here he saw pepper and ginger growing and obtained information concerning cinnamon and cloves.



Phoenician Ships (About 700 B. C.).
From a Relief in the Palace of Sennacherit.

Upon returning to Egypt he learned that his partner, Payva, who had started for Abyssinia, had been murdered. Covilham sent the report of his Indian voyage to King John by messenger and remained in Abyssinia to complete his companion's task. Here he made himself so useful to the monarch of that land that he stayed there until he died, serving his native land, meanwhile, by frequent reports and correspondence.

During this period the famous Genoese navigator, Christopher Columbus, had made his first voyage across the Atlantic in search of the same goal on behalf of Spain. The voyage of Columbus in

1492 might with propriety be called the most successful failure in all history. It has little to do with our story except that it kindled anew the hopes of the Portuguese in connection with the African coast route. Columbus died in ignorance of the fact that he had not discovered the far-famed Indies. He had started for Cathay, and his navigating instincts were sound, but he did not realize that a new continent interrupted the passage between him and his goal. His discovery may be most aptly termed the most valuable by product of the search for the Spice Islands.

In 1495 Manuel (called by historians "the Fortunate") succeeded John II as King of Portugal and decided to carry on the exploration policy of his two successors. Seldom in history has continuity of effort been exhibited in a greater degree. For more than three-quarters of a century these three Portuguese nobles had followed a line of endeavor which had brought some valuable results, the main object still being unattained. But success was just beyond the threshold.

In 1497 Manuel selected a well-known Portuguese navigator, Vasco da Gama, and placed him in charge of a small fleet of three vessels which sailed from Lisbon in June, and which rounded the Cape of Good Hope in November of the same year. They reached Mozambique a few months later, but the ruling sheik showing evidences of treachery, da Gama continued his journey up the east coast of Africa, arriving at Melinda on the Zanzibar coast. Here he was advised to await favorable winds for the continuation of the journey to India, for which the king of Melinda, being favorably impressed by da Gama, provided two experienced pilots, the third vessel of da Gama's fleet having been abandoned somewhere on the east African coast after salvaging all stores and metal parts.

The two Portuguese vessels left Melinda in July, 1498, and reached Calicut in India about a month later. The Moorish traders, much surprised at the arrival of the Portuguese vessels, tried to interfere with their traffic with the Indian natives, but the Portuguese having, in addition to gold and silver coins of the Portuguese realm, abundant stocks of coral, copper, amber, quicksilver and vermilion, all in great demand by the natives, had no difficulty in establishing mercantile relations.

These were the days of relative rather than actual values. Shrewd bargaining was the order of the day and no transaction was

considered to be successful unless each party believed that he had outwitted the other.

The first cargo that da Gama took back was composed of pepper, cinnamon and ginger. He did not insist upon keen bargains being driven by his agents and accepted without question even low grade stocks of these spices. He was wily enough to realize that if he arrived safely at Lisbon with any cargo of spices, thus demonstrating the feasibility of such voyages, the subsequent expeditions would be amply equipped to take care of Portuguese interests, which proved to be the case.

The Moors continued their trouble-making efforts while da Gama's vessels were loading and even succeeded in having him imprisoned for a time, an indignity which he bore with surprising mildness, as he realized his helplessness if he offered armed opposition. He finally set sail for home, secretly vowing vengeance upon both Moors and natives, which vows he kept in a terrible manner, as we shall soon see. On the homeward voyage he made several stops, one at Melinda, where he exchanged presents with the king, who sent a letter of friendship to Manuel written on gold leaf.

On September 18, 1499, he arrived in Lisbon and was greeted by the king and the inhabitants with great demonstrations of joy. He was immediately rewarded by having the noble title of "Dom" conferred upon him, and was further presented with 20,000 gold pieces, besides being accorded other emoluments and privileges. The voyage had paid a sixty-fold profit to those who had financially sponsored it, so great generosity was also shown to the captains and mariners, who in addition to other rewards "were each given ten pounds of spices for their wives to divide with their gossips and friends."

In the meantime Venice had gone ahead serenely, in ignorance of the doom which was awaiting her commercial supremacy. When it became known on the Rialto that Portuguese vessels, laden with Indian spices, had successfully returned to the harbor of Lisbon, great consternation was shown. The Venetians were in a peculiarly difficult position. They had the vessels and the sailors to follow the same route as the Portuguese, but they were deeply involved in Alexandria, where they carried immense surplus stores, and they feared these would be sacked by the Egyptians if they followed the Cape route themselves.

In their chagrin, the Venetians even went so far as to incite the Egyptians and Moors to co-operate with Indian potentates to attack the Portuguese expeditions, but without avail. The immense profits of the Venetians were gone, never to return, and the subsequent mercantile career of this Italian republic was concerned only with the distribution throughout Europe of the spices which the Portuguese brought to Lisbon, for strangely enough, the latter never seemed to care for the profits beyond the original handling, and this indifference was eventually to cost them the loss of the entire trade, as we shall see.

In 1500 the Portuguese king sent out a fleet of thirteen ships under Pedro Cabral. This fleet was blown out of its course and scattered to the westward, some of the ships reaching Brazil. Only six vessels of the fleet reached India. Here they had difficulty with the Moors, to whom they gave a foretaste of Portuguese severity by seizing and destroying several Moorish vessels after transferring their rich cargoes to Portuguese ships. Cabral established friendly relations with several Indian potentates and left agents or factors at a number of places. He returned safely to Lisbon heavily laden with valuable spice cargoes.

In 1502 da Gama was sent out with nearly a score of caravels. With the daring of his race he shortened the time of his voyage, after rounding the Cape, by striking boldly across the then uncharted Indian Ocean. Upon his arrival in India he sent the following characteristic message to an Indian potentate whom he encountered:

"This is the fleet of the King of Portugal, my sovereign, who is the lord of the sea, of all the world, and also of this coast, for which reason all of the rivers and ports which have got shipping have to obey him and pay tribute, and this is a sign of obedience—neither trading in pepper, nor bringing Turks, nor going to the port of Calicut. For any of these three things, the ships which shall be found to have done them shall be burned with as many as shall be captured in them. Let the King send me an answer. If it be not a good one, I will send and burn ships and town and cause much harm to be done."

It will be seen that the first steps taken by the Portuguese were to secure an absolute monopoly of the spice trade. On this same voyage da Gama captured a richly laden Moorish vessel, transferred the cargo to his own vessels and burned the captured vessel with its crew and passengers of several hundred living souls. Among the

passengers were wealthy Moorish merchants from Egypt, who pleaded with da Gama for their lives, offering as a ransom to fill all his vessels with pepper if he would but set them safe ashore at Calicut. With fiendish heartlessness da Gama refused their entreaties, in spite of the advice of his own officers that he assent.

This was but a mild beginning of the satisfaction of the terrible desire for vengeance which seemed to fill da Gama's soul and which makes him one of the most atrocious characters in history. Other vessels bound from Coromandel to Calicut fell into the hands of da Gama. After plundering them, the unfortunate mariners were bound, their hands, ears and noses cut off, their teeth crushed in, and their bleeding, writhing, living bodies loaded into one of the captured vessels, which was then fired. The severed members of the victims were loaded into another ship and sent ashore as an object lesson to all who should, in the future, question Portuguese authority.

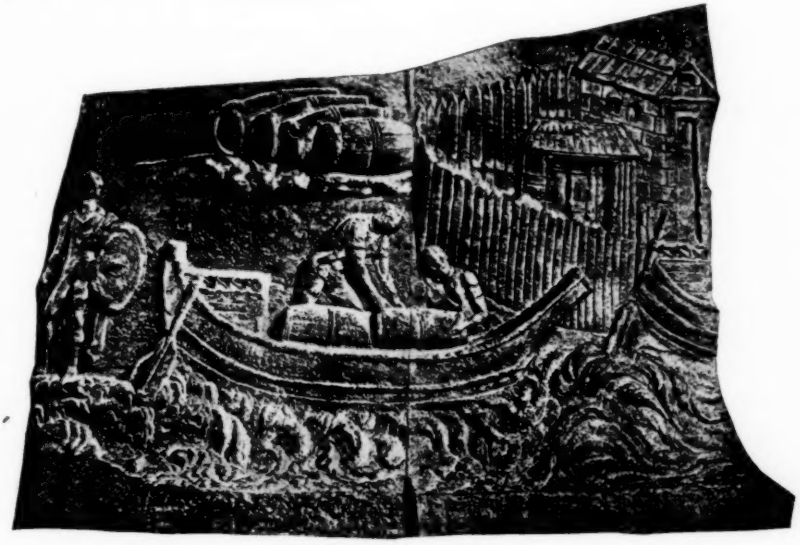
Upon this voyage, da Gama left a trail of trading stations with agents in charge, supplied with stocks of goods for barter.

Portuguese expeditions now followed each other in rapid succession, each year seeing a score or more of vessels returning to Lisbon with profitable cargoes. The policy of the Portuguese was not to annex territory but to establish numerous factories or trading stations and to destroy the commerce which the Moors had controlled for centuries without interference. Vasco da Gama, now Count of Vidigueria, made but one more voyage, many years later, in 1524, and died in Goa in December of the same year.

Meyerbeer's opera "L'Africaine" concerns itself with da Gamas' earlier voyages and the stellar role is that of the Portuguese hero.

In 1505, Francisco de Almeida was appointed first Viceroy of India and sailed from Lisbon with more than a score of vessels. He was authorized to establish trading stations and build and garrison forts, which was dône. The most prominent name associated with the establishment of Portuguese power in India was Alfonso de Albuquerque. It was he who gained Ormuz, the port which controlled the traffic of the Persian Gulf, for the Portuguese. It was Albuquerque, too, who conquered Goa for the Portuguese. Goa, the one-time capital of India, whose regal splendor and untold wealth has long since departed, is one of the footholds in Asia still retained by the Portuguese. This is a fact surprising to many who believe that the whole of India is under British domination.

Goa was for many years the official residence not only of the Portuguese viceroy of India but of the King's Counsel and the Archbishop as well. The Viceroy held office for three years, but according to Linschoten (a Dutch traveler who plays a prominent part later) the term was too short for the incumbent to do much important work for the King. The first year, says Linschoten, was occupied in learning the manners and customs of the country, the second year in amassing a fortune upon which he could retire, and the third year in getting his accounts in order so that his successor might not find him a defaulter.



Roman Cargo Boats Being Loaded at a River Landing.
(A Section of Trojan's Column.)

The Portuguese under da Gama, Almeida, and Albuquerque, having established themselves satisfactorily on the Malabar coast of southwestern India, commenced to realize that many of the spices were coming to them at second and third hand, for pepper and ginger were the only spices actually grown in this section. Cloves, nutmegs, mace and cinnamon came from points still further east, in some cases thousands of miles.

To give an idea of values and possible profits at this time, cloves may be taken as an example. A bale of cloves (500 pounds) was worth two ducats (about $5) in the Moluccas, the country of

their origin. It was worth fourteen ducats by the time it reached Malacca, and 500 ducats in Calicut, an increase of over two hundred fold. At this period it was worth nearly 2000 ducats in London.

The Portuguese also learned that the Moors were carrying on a trade in these spices between these far eastern isles and the Red Sea ports, without any contact with India. This could not be tolerated. In 1505 Almeida had reached Ceylon, the land where the finest cinnamon grows. In 1509 he had obtained a foothold in Malacca, more than a thousand miles to the eastward, and in 1511, Albuquerque's ships had skirted Sumatra and Java and reached the Banda Islands, then the source of the world's supply of nutmegs and mace, and which were a thousand miles beyond Malacca.

The Molucca Islands, or clove islands, as they are called, because they were the only spots in the world at that time where the clove tree was found, and which lay several hundred miles north of the Banda Islands, were reached by the Portuguese in 1512. The Portuguese were the first Europeans to arrive at this tiny spot, which was to cause centuries of strife between Moors, Portuguese, Spaniards, Dutch and English, in which strife the islanders themselves were exterminated and the clove trees uprooted and destroyed, for all the clove trees at the present time are in plantations in other parts of the world. The tree does not exist, even in the wild state, in its original habitat.

In 1513, Albuquerque captured Malacca and obtained for his sovereign a pledge of amity from the King of Siam. Shortly after this the Portuguese tightened their grip on the commerce of the Indies and were in virtual control of everything from the Cape of Good Hope to the Moluccas. This monopoly lasted for nearly the whole of the sixteenth century, which was the zenith of Portuguese power and commerce.

Portugal had also gained a foothold in China during this century, for the far-famed products of Cathay, silks, perfumes and spices, had been carried by caravan for centuries across the entire Asiatic continent to the Caspian or Mediterranean Seas. A few Chinese junks had traded with the Moors at Malacca, but all of these routes were expensive, and for more than a thousand years rhubarb, of which China was the sole source, was the most costly drug in Europe.

During this century of Portuguese control the natives of that

country who established themselves at the forts or trading stations, lived like Oriental princes, surrounding themselves with slaves and enjoying luxuries of every description. Jean Baptiste Tavernier, a seventeenth century author of Travels in India, refers humorously to "Hidalgos of the Cape," referring to the practice of many Portuguese of mean birth who prefixed "Dom" to their names on rounding the Cape of Good Hope on the outward trip.

Shortly after the discovery of America by Columbus, Pope Alexander VI had attempted to divide between the crowns of Spain and Portugal all of the lands that had been or were yet to be discovered. The dividing line was a meridian passing through a point 100 leagues west of the Cape Verde Islands and another line 180 degrees to the westward, or on the opposite side of the earth. Later the line was moved 270 leagues further to the west. Each party was permitted to sail in the seas belonging to the other, but neither dared trade outside his own dominions.

About 1516 a Portuguese explorer named Fernandus Magalianes was offended by King Manuel and in his indignation renounced his allegiance to that king and journeyed to the court of Castile, where he told the King of Spain that the Molucca Islands belonged to him and that he could reach them by sailing to the westward (which would bring them within the Spanish domain according to the agreement with the Pope).

Magellan, for it was none other, set sail from Seville in August, 1519, with a squadron of five vessels. He sailed directly for Brazil and skirted the eastern coast of South America to Patagonia, where he stopped for a time. Here a mutiny arose in the crews, which Magellan ended by hanging and quartering the ringleaders. This daring navigator then assembled his fleet and on his flagship "Victory" sailed through the terrible straits, which ever since have borne his name.

The *Mare Pacificum,* or Pacific Sea, which he called the quiet water beyond, was sighted November 28, 1520. Shortly after this one of his vessels deserted and returned to Spain. Dreadful hardships were experienced during the long voyage across the Pacific, which lasted for ninety-eight days with no sight of land. The food supplies became exhausted and the water putrefied, and they supported themselves for the last part of the voyage by chewing leather which was dragged in the sea for several days to soften it,

and by eating the rats which infested the ships. Magellan's fleet saw land for the first time in March, 1521. It was the group of islands about one thousand miles east of the Philippines, which Magellan named the Ladrones (meaning robbers) because the natives stole everything they could lay hands on.

Again they set sail for the Spice Islands to the west. Again land was sighted, this time a larger group, which Magellan named the Philippines, after Prince Philip, the son of his master, Charles V of Spain. Magellan was at first well received by the natives, but when he tried to convert them to Christianity by force the natives murdered him, and his fleet had to set sail without him.

Borneo was next reached, and finally in November, 1521, Tydore, one of the Clove Islands. Here the Spaniards made a treaty with the king and loaded their ships with cloves in exchange for quicksilver, cloth and glass cups. By this time, only two ships remained of the fleet of five. One of these was lost at Borneo, and the remaining vessel, the "Victory," under Sebastian del Cano, alone reached Seville, after three years of hardship, but with the achievement of having been the first vessel to circumnavigate the globe.

Other Spanish expeditions were sent to the Moluccas by the westward route and the Spaniards established trading stations of their own. The Portuguese resented this and for many years the two nations quarrelled and fought, each maintaining that the Moluccas fell within the dominions granted it by the Pope and each had maps to prove the justice of its claims.

Expeditions were sent to the Moluccas by Spain with the west coast of Mexico as a starting point. The natives of these unfortunate islands allied themselves alternately with each nation. The strife was ended only by the sale to Portugal by Charles V in 1529 of the Spanish claim to sovereignty in the Islands. The Spaniards then devoted their attention to the Philippines, where they founded Manila and established rich commerce in products of the Orient through China. One expedition which the Spaniards sent out from Peru, discovered a group of islands so rich in gold and spices that they believed them to have been the islands from which the famous builder of the temple at Jerusalem had obtained his riches, and they were therefore named the Solomon Islands.

During nearly the whole of the sixteenth century the spice-laden carracks of the Portuguese traversing the Cape of Good Hope route

made Lisbon the most important commercial centre in Europe. Her docks and warehouses were piled high with the rare and aromatic products of the Eastern countries. The distribution of these valuable commodities the Portuguese left to other nations, among which were the Venetians, now receding from their former grandeur.

The Venetians in their prosperous centuries had not been too proud to act as merchants as well as conquerors. The Portuguese were above that and left the northern European carrying trade almost entirely to the Dutch. Antwerp and Amsterdam became great international markets where "Osterling, Turk, Hindoo and Atlantic and Mediterranean traders stored their wares and negotiated their exchanges," according to Motley.

The Netherlands in the sixteenth century consisted of three divisions, *i. e.*, the Walloons, or the provinces next to France; the Flemish, corresponding to modern Belgium, and Holland, consisting of the coastal states. It was united into what was called a States-General, whose power was subject to Spain, of which the Netherlands was virtually a tributary state.

In 1567 the Dutch revolted from the intolerable rule of Philip II and commenced the long struggle, which finally yielded them their independence. For upward of thirteen years, although a bitter military struggle was waged between Spain and the Netherlands, the commerce between the two countries went on with but slight interruption. In 1580, when Spain and Portugal became united, Philip decided to strike a final blow at the Dutch by destroying their commerce. He forbade Dutch vessels to trade in Spanish or Portuguese ports under penalty of confiscation and imprisonment of their crews. This turned the thoughts of the Hollanders to the possibility of direct intercourse with the Indies, which they had never before attempted.

During the whole of the sixteenth century the other European nations seem to have conceded to the Portuguese the exclusive title to the Cape route by right of discovery. England and Holland, while admitting Portugal's right to the Cape route and Spain's right to the route taken by Magellan, did not concede the right of the Pope to divide these rich eastern possessions between Spain and Portugal.

The rulers of England and Holland believed that if they could find a northwest or northeast passage, the opposite of the respec-

tive routes discovered by da Gama and Magellan, they would have a perfect right to trade with Cathay and the Spice Islands. Besides, the Portuguese had jealously guarded the charts of the Cape route, perfected by nearly a century of navigating research and exploration. Fortunately for Holland and unfortunately for Portugal, the Dutch had a young man named Linschoten, who, spurred by a longing for adventures in strange lands, had joined one of the Portuguese Indian fleets and had become a member of the suite of the Archbishop of Goa, where he remained for five years. In 1596, several years after his return to Holland, he published the record of his East Indian experiences.

This work was a rare storehouse of information for the Dutch, for Linschoten had recorded his observations, not only of the social, political and religious institutions of the natives and their Portuguese masters, but had written with accuracy and much detail concerning plants, animals and minerals, and of the geography, including notes on winds, currents, shoals and harbors. His work was of inestimable value to the merchant, the mariner and the scientist.

This work of Linschoten's was the greatest single factor in the subsequent triumph of the Dutch in the struggle for the possession of the trade in spices. Several unsuccessful attempts had been made in the later part of the sixteenth century by Dutch navigators to reach the Orient by a northern passage, which they believed would cut at least 10,000 miles from the distance. These efforts, of course, were futile. They then turned their attention to the Cape route and within a year after the publication of Linschoten's book the Dutch had sent a squadron to the Eastern Archipelago.

It visited numerous native ports and was greeted everywhere by the evidences of Portuguese hatred. This expedition arrived back in Holland in 1597, with a heavy loss of men by scurvy, but at a great commercial gain, and what was more important, the initial voyage had been made. Within a few months another and larger squadron was under way, and this reached Bantam Harbor in December, 1598. This important port at the extreme western end of Java, was a great pepper market. All of the vessels were back again in Amsterdam by April, 1600, with pepper, cloves, nutmegs and mace.

In 1598 another fleet had started for the same destination by the route discovered by Magellan, and which had also by this time been

traversed by Drake and Cavendish. This fleet captured two Spanish vessels en route and had a battle in Manila Harbor with another Spanish fleet. Other expeditions were sent by the Hollanders in rapid succession, and between 1595 and 1601 forty-six ships had been sent to the Orient by the Dutch, of which forty-three had safely returned.

Soon after the Dutch commenced their direct trade in the East, the merchants of Europe began to complain that spices were becoming too cheap. In 1602 the States-General granted to the Universal East India Company a charter conferring the exclusive right to trade to the eastward of the Cape of Good Hope and to sail through the Straits of Magellan. This company was given power to make treaties, levy troops and build forts. Of the prizes captured from Spain on the high seas a certain proportion was to go to the Admiralty.

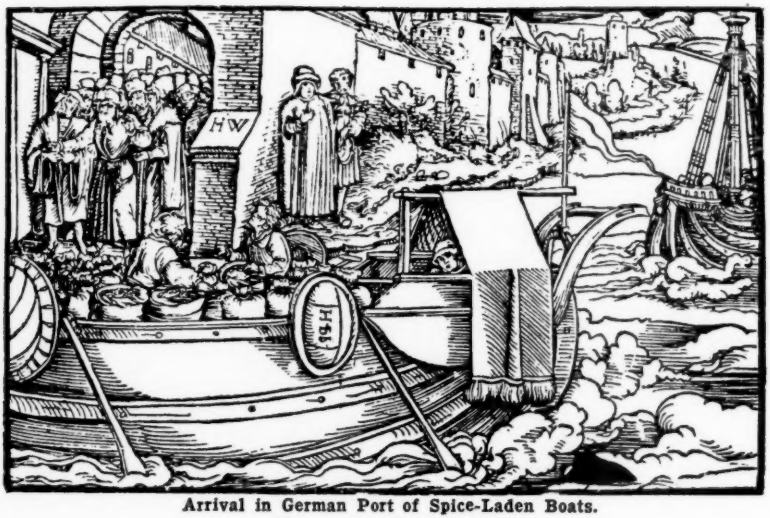
The Dutch evolved a new type of vessel. Built primarily to carry merchandise and staunchly seaworthy, they could quickly be transformed into formidable fighting craft. Many of their captains were veterans of the wars with Spain. Fight after fight followed in rapid succession. Armadas were dispatched from Spain to protect the factories scattered through their new possessions, as well as to guard the richly laden carracks heaped high with stores of fragrant spices.

In 1601 a Dutch skipper, Jacob Heemskerk, while off the Malay peninsula, sighted a Portuguese carrack with a cargo of spices. Although Heemskerk had but 130 men and his opponents 700, the doughty Dutchman captured the Portuguese vessel and divided the rich booty among the members of his crews. In 1602, Spilberg, the first Dutchman to trade with Ceylon for cinnamon, fought and captured three Portuguese ships and gave their captains to the King of Ceylon. Wolfert Hermann, another indomitable Hollander, with a fleet of five small vessels, engaged a Spanish armada of twenty-five vessels, captured two, sank and drove ashore a number of others and scattered the remainder.

The Dutch then settled permanently in Bantam and established their first factory within a few leagues of the spot where the city of Batavia was later located by them on a congenial swamp, which was duly laid out with canals and bridges, trim gardens and well-built houses.

Many encounters between the Dutch on one hand and the Spanish and Portuguese on the other now took place. Naval battles occurred in every clime and on every sea. The Dutch, though usually inferior in numbers, both as to ships and men, were better navigators in the emergency of battle and usually won by outsailing and outmanœuvering their antagonists.

The Dutch were now not satisfied to whip their enemies upon the sea and within a few years were bombarding and capturing Spanish and Portuguese forts all over the Eastern Archipelago. After Bantam, they established forts at Jahore, Achin and Amboyna.



Arrival in German Port of Spice-Laden Boats.
From a Woodcut of 1539.

The true Moluccas or Clove Islands, as previously referred to, had long been a bone of contention between the Moors, the Spaniards and the Portuguese. The Dutch now essayed to control this valuable group and the ownership shifted several times within a few years according as one or the other of the fleets was victorious. The Dutch were finally victorious under Matelieff.

Motly says of the Clove Islands: "The world had lived in former ages very comfortably without cloves. But by the beginning of the seventeenth century that odoriferous pistil had been the cause of so many pitched battles and obstinate wars, of so much

vituperation, negotiation and intriguing, that the world's destiny seemed to have become dependent upon the growth of a particular gilly flower. Out of its sweetness had grown such bitterness among great nations as not torrents of blood could wash away. A commonplace condiment enough, it seems to us now, easily to be dispensed with, and not worth purchasing at a thousand human lives or so the cargo, but it was once the great prize to be struggled for by civilized nations."

The Dutch intrenched themselves in their monopoly of this spice by introducing the tree into Amboyna and similar islands under their safe control, and extirpating it from the Moluccas, its original sole habitat. As has been said, the clove tree is not found today in the Moluccas, most of the world's supply coming from Zanzibar on the East African coast, where it has been introduced during the past century.

In the case of nutmeg and mace, the continued and determined efforts of the Dutch to restrict it to the Banda Islands were long marked with success. The clove is an immature flower bud and cannot be used for propagation of the plant, but the nutmeg is a kernel or seed, and needs but to be planted in favorable climate to establish a rival source of supply. In order to prevent the nutmeg kernels from germinating the Dutch immersed them in milk of lime for several months. They later discovered that exposure to sunlight for a week would accomplish the same purpose, but so firmly established had become the custom that the practice of coating or powdering nutmegs with a white covering (liming, as it is called) still persists, at a time centuries after the original need for such procedure has passed, for the tree is now successfully cultivated in the West Indies, from which part of our supplies come at the present time.

The Dutch also established and maintained a control over cinnamon (at least the Ceylon variety) for a long time, although the continued hostility of the King of Kandy, the capital of Ceylon, necessitated the employment of thousands of armed guards during the collecting season of this valuable bark.

Batavia, under Dutch development, grew to be one of the finest cities in the Eastern world. Cosmopolitan in its population, which included Javanese, French, German, Portuguese, Chinese and Moors, besides the Dutch who ruled it, it came to be known as

"The Queen of the East." This city was the centre of all activities in the Indies—political and commercial. The President was absolute in authority and held office for life. The middle of the seventeenth century was the zenith of Dutch control.

During the two centuries that have been covered by the recital of Portuguese and Dutch control, the English had not been idle in their search for a route to the Spice Islands. John Cabot, a Venetian navigator, who had offered his services to Henry VII, had essayed to reach them the year that da Gama started on his first voyage around the Cape, and had reached Labrador, this being the first expedition (except that of the Vikings) to reach American mainland. Sebastian, his son, during the following year explored the Eastern Atlantic coast of America as far south as Hatteras, always seeking an opening through which vessels might continue on their westerly journey.

Other English voyages in search of the supposed northwest passage were attempted in 1517 and 1527. In 1576 Sir Humphrey Gilbert essayed in a book to prove the existence of a northwest passage and in 1578 Richard Hakluyt wrote along similar lines. In 1589 we find that Queen Elizabeth granted authority to Adrian Gilbert to seek a new passage to China and the Isles of the Moluccas.

In 1553 an English expedition had attempted a northeast passage and found its way into the White Sea. Of the three vessels two became icebound, and were lost with all their crews, while the crew of the third, after traveling 1500 miles over ice and snow in sledges, reached the court of Ivan the Terrible, at Moscow, thus establishing the earliest commercial relations between the English and the Russians. In 1555 the celebrated Muscovy Company was chartered, "to use all wayes and meanes possible to learn how men may pass from Russia either by land or sea to Cathia."

In 1558 an English explorer, named Jenkinson, journeyed down the Volga to the Caspian Sea and from thence reached Bokhara by caravan. He found the overland route to China closed by wars in Central Asia and reported the commerce of Bokhara as decadent. Between 1561 and 1581 six trading expeditions were sent to Bokhara over this route by the English. The trade was thus stimulated and improved and many spices were brought back to London.

Interesting information was brought back or reported by fac-

tors of the Muscovy Company during this period. One says: "There is a great river which falleth into the Caspian Sea by a town called Bachu, near unto which is a strange thing to behold, for there issueth out of the ground a marvelous quantity of oil, which oil they fetch to the uttermost bounds of Persia. It serveth all the country to burn in their houses."

In 1581 (following the accidental destruction of a Venetian galley and the abandonment of the distributing trade by them, as previously related) Elizabeth granted a charter to the "Merchants of the Levant," which essayed the same trade via the Eastern Mediterranean and Constantinople. One of the factors of this company wrote: "Without the city Cairo are to be seen divers pyramids, among which are three marvelous great. Out of them are digged daily the bodies of ancient men, not rotten but whole. And these dead bodies are the mummies which the Apothecaries do against our will make us to swallow."

Another and less creditable chapter of English activity in connection with the spice trade concerns itself with the exploits of those freebooting adventurers—Drake, Hawkins, Grenville and Oxenham, who in their little armed ships went out to harass the navies and capture the homeward bound treasure and spice ships of the King of Spain. How they sacked the cities of the Spanish Main and even sailed into the harbors of Spain itself and carried off rich prizes has been the theme of song and story for centuries.

Drake's notable voyage of circumnavigation began in 1577. Like his illustrious predecessor, Magellan, he was confronted with a mutinous condition and was compelled to execute his warm friend, Captain Doughty, who had been second in command, for trying to desert with one of his vessels. It was upon this voyage that Drake discovered Cape Horn, after having passed through Magellan's Straits, by being beaten back by a storm. Drake's fleet spread havoc among the Spanish settlements on the Pacific coast of South America. He later visited the Philippines, the Moluccas, Java and Sumatra, and finally rounded the Cape of Good Hope, and arrived home in 1580.

Philip of Spain demanded of Elizabeth that Drake be publicly hanged as a pirate for his attacks upon the Spanish settlements and ships. Elizabeth's canny answer was: "If we find Drake has injured our friends he will be duly punished."

Thomas Candish, an English captain, in 1586 circumnavigated the globe by the same route and came back laden with the choicest treasures of nineteen Spanish ships, which he had pillaged, burnt and sunk. He brought to Europe the first star anise that had been seen in the West. The English activities did not gain them much, but the authority of the Pope's bull had been nullified and thenceforth the trade in the East was open to him who could reach and hold it.

Ruins of Portuguese Fort on Telicherry Coast, India.

Although several of the English voyages had been successfully accomplished before the Dutch began, the Hollanders soon left the English behind in the strenuous race for the trade of the Indies. This led the English merchants to protest to their sovereign. In consequence of these protests, Elizabeth, in 1599, signed the charter of "The Governor and Company of Merchants trading to the East Indies." This conferred the privilege of exclusive trade into the "countries and ports, towns and places of Asia, Africa and America or any of them beyond the Cape of Buena Esperanza or the Straits of Magellan, where any traffic may be used."

The first expedition under the new company sailed February

13, 1601. After capturing a Portuguese carrack on the way down the African coast, and after many hardships due to scurvy, the English fleet reached Achin, Sumatra, in June, 1602, and found Spanish, Portuguese and Dutch ships, besides native traders.

Captain James Lancaster, in charge of the expedition, presented a letter from Elizabeth to the ruler, and also numerous gifts attractive to the native prince. A treaty was granted, but Lancaster soon found that getting a treaty was considerably easier than getting a cargo, so he went out on the high seas and captured several Portuguese carracks. Elizabeth died before Lancaster's return in 1603.

The English trading policy was entirely different from any of their competitors. They made their foreign trade build up their home industries by sending products of their manufacture to barter for spices, etc. At this time every English merchant vessel was a privateer. They had learned from Lancaster's experience that it was easier to capture Portuguese carracks than to trade with the natives, so an era of brigandage and freebootery began, which continued until the Portuguese were entirely crowded out by the Dutch and the English, who were always the aggressors and also better sailors and fighters.

The last blow to Portuguese commerce occurred when the English, after a long siege, captured the port of Ormuz, which was the key to the commerce through the Persian Gulf. The English and the Dutch then started bickering and fighting and their disagreements were not ended until after the Napoleonic Wars, the final settlement being the Anglo-Dutch Treaty of 1824, although as late as 1871 and again in 1895, supplementary agreements were recorded.

Before closing, let us give some slight consideration to the spices themselves, enumerating them and referring to particular points of interest in their individual histories. Spices may be defined as "substances aromatic or pungent to the taste, or to both taste and smell." In Circular 136 of the U. S. Department of Agriculture, in which standards for many food products are provided, spices are defined as "Aromatic vegetable substances used for the seasoning of food." The list given in this circular is a very complete one and is as follows:

Allspice, aniseed, bay leaves, capers, caraway, cardamom, capsicum (Cayenne or red pepper), celery seed, cinnamon, cloves, cori-

ander, cumin, curcuma (turmeric), dill, fennel, ginger, horseradish, mace, margoram, mustard (white and black), nutmeg, paprika, Paradise grains, parsley, pepper (black, white and long), saffron, sage, savory, star aniseed, tarragon and thyme.

Of these more than thirty kinds of spices, to which garlic, onions, leeks, chervil and others might also be added with propriety, only a few are mentioned in the Bible. They are anise, cinnamon, coriander, cumin, dill, hyssop, mustard and saffron.

The older authors divided spices into three well defined groups, *i. e.*, stimulating, as mustard, capsicum, horseradish, etc.; aromatic, as cinnamon, cloves, nutmeg, etc.; and sweet herbs, as thyme, sage, marjoram, savory, etc.

The retail merchandising of spices was at one time exclusively the province of the apothecary; later the apothecaries became associated with the spicers or sellers of spices and foodstuffs, and those who handled in wholesale quantities were known as grocers, because they sold in gross or large lots, a term which in our time has come to be used for one who sells foodstuffs of various kinds, including spices.

In the sixteenth and seventeenth centuries spices had become much reduced in price, but they were still so expensive that the laborers in the warehouses and docks were provided with special canvas suits without pockets. In our own time they have become so commonplace and cheap that every household has a spice cabinet or closet, or a collection of about a dozen of those which are more frequently used.

Allspice, which is called by that name because its flavor resembles a blending of several spices, is a product of the Western hemisphere, a native of Jamaica, from whence comes most of the world's supply. Taken back to Europe on one of Columbus's voyages the Spanish gave it the name Pimienta, which means pepper, because of its resemblance to the black peppercorns. This was later changed to Pimento, which is its pharmacopœial name.

Aniseed originally came from western Mediterranean countries, particularly Crete and Egypt. It is now grown in many European countries, and before the World War much of the best anise came from Russia.

The *bay leaves* used for condimental purposes are the product of a laurel species, entirely different from the plant which yields the

leaves used in making bay rum. Bay leaves come from Spain and Italy. The sticks of licorice extract, so attractive in our childhood days, were packed with bay leaves to keep them from being broken in transit. The bay leaves were also used in making the wreaths with which the victors in the ancient games were crowned.

Capers are the flower buds of a shrubby plant and are brought from southern European countries.

Caraway seeds, popularly known as "kümmel" when used in rye bread, were originally grown in Europe, which still furnishes much of the commercial supply, although this is one of the few spices now used in the Orient although not its original home.

Cardamom has been used in India from the remotest times. It has always figured more prominently as a drug than as a spice in Eastern countries. Ceylon and India furnish most of the world's supply.

Capsicum species (red or Cayenne peppers) are natives of the Western hemisphere. They were cultivated from time immemorial in Mexico and South America, and are not now known in the wild state at all. Columbus sought for black pepper and found red. The many varieties of red pepper now cultivated in various parts of the world have been of great importance and interest. Little or none of the world supply (not even our own) comes from America. Mombassa, on the west coast of Africa (that from Cayenne is esteemed as the finest), and Japan, are rivals for the world's markets of this superpungent spice, which has enriched (?) our language with the slang word "pep." There are less pungent or even sweet varieties of capsicum, popularly known as paprika. The best of these come from Hungary and Spain. The word "Chilli," used in Chilli sauce, chilli-con-carne-, etc., is of Mexican origin and was being used by the followers of Montezuma when Cortez arrived.

Celery seed is a native of Europe. It is mentioned in the Odyssey and by Dioscorides. The plant is cultivated here largely as a vegetable but our supplies of the seed come from Europe.

Cinnamon has been mentioned as a native of Ceylon, which is in all probability its original habitat. It has been held in high esteem from the most remote period. It was one of the first spices sought in all Oriental voyages. Other varieties come from China, Saigon and Batavia. Until the eighteenth century none was cultivated. The well-known hymn

"What though the spicy breezes
Blow soft o'er Ceylon's isle,
Where every prospect pleases
And only man is vile,"

was probably inspired by thoughts of the Portuguese and Dutch cruelties.

The *clove* tree, as has been said, is no longer found, even in a wild state, in the true Moluccas. The East Indian supplies came through the Dutch at Amboyna and the English at Penang. In the seventeenth century the clove tree was planted at Zanzibar, off the East coast of Africa. From this point much of the present supply comes. The methods of the Dutch traders, practiced to keep up the prices of this spice, were shown about a half century ago, when a cyclonic disturbance in Zanzibar uprooted and destroyed nearly all the mature fruit-bearing trees. It was years before the Zanzibar plantations again became productive and the Dutch supplied the extra needs from surplus stocks held at Amboyna. The marks on some of these Dutch packages, when they arrived in New York, showed that they had been held in stock for nearly 100 years by the Dutch, and they were still in excellent condition. The preservative effect of cloves and of clove oil is well known. Amboyna, Penang and Zanzibar furnish the world's present supply.

Cloves were the most highly esteemed and the most valuable of all the spices, even at very remote periods. During one of the Chinese dynasties of the third century B. C. it was customary for officers of the court to hold a clove in the mouth before addressing the sovereign, in order that the breath might have an agreeable odor. This custom was also prevalent in the dynasties of a much later period, even in that preceding the Volstead era, but for a somewhat different purpose.

Coriander is a native of Greece and Egypt. It is cultivated in various parts of continental Europe and has been introduced into Africa and India.

Cumin was well known to the ancients. It is referred to in both the Old and the New Testaments. It was one of the most commonly used spices in the Middle Ages, but is little used at present except in blends and mixtures. It comes into commerce from Sicily, Morocco and India.

Curcuma or Turmeric (tumeric, as it is usually called or spelled

by the careless or illiterate) is a native of India where it is highly esteemed both as a condiment and a dyestuff. It is the predominating ingredient in curry powder. Curry is the Oriental name for a dressing, relish or flavoring for boiled rice and it is used both as a noun and as a verb. The entire supply comes from India.

Dill is another spice known to the ancients and referred to in the Bible. Its principal use now is to impart a flavor to a certain type of pickled cucumber. It is usually grown locally in whatever part of the world it is used.

Fennel seed is a near relative of anise, caraway, coriander, cumin and dill. It is a European plant, known to the ancient Romans. It is cultivated in France, Germany, Austria and Italy, and also in India and China, where it has been introduced. Our supplies come from Europe. It is used more in medicine than as a spice.

The *Ginger* plant is a native of India, from which it has been introduced into China, the East Indies, Africa and the West Indies (Jamaica). Some varieties of ginger are peeled, scraped and "limed," probably in the earlier days to prevent propagation by planting. Its pungency and pleasant aroma make it popular in confections and beverages, and its stimulating properties are recognized, not only in medicine, but in present day slang, as every one knows what is meant when the request is made to "put some ginger into it." The principal commercial supplies reach us from Africa and Jamaica, although Cochin and Bengal gingers are also known.

Mace and *Nutmeg* are different parts of the same fruit. The tree is a bushy evergreen, found wild in a number of islands adjacent to the western peninsula of New Guinea, including the Moluccas, and in the Bandas, a group of volcanic islands which played an important part in the romance and history of the spice trade. It has been introduced and cultivated in Sumatra, Malacca, Bengal, Singapore and Penang, as well as in Brazil and the West Indies in our own hemisphere. Its use had been known throughout Europe even prior to the Venetian control of the spice trade. Strangely enough, although valued highly in all other parts of the world as a condiment or flavor, neither nutmeg nor mace is ever so used in the islands where the plant is indigenous.

The fruit is the size of a small peach, having a thick, fleshy pulp, which encloses the kernel (the nutmeg), surrounded by the

membranous mantle, which is the mace. America's supply comes from both the East and the West Indies. Siau mace and nutmegs come from the Dutch Islands north of Celebes. Penang varieties come from English possessions. The West Indian supply comes principally from New Granada.

Several times during the early days of Dutch control it is reported that heaps of nutmegs as large as a church were burned by the Hollanders in order to keep up prices.

Some kinds of nutmegs or mace, such as the Bombay variety, are of so little spice value that they are looked upon as adulterants. It will be remembered that Connecticut is jocularly known as the "Nutmeg State," from the reputation given it by the keen Yankees, who are alleged to have made and sold wooden nutmegs (but once to the same customer).

Marjoram is a fragrant herb used in soups, sausages, etc. The supply comes principally from France.

Mustard is one of the most widely distributed and ancient of plants. Its earlier uses seem to have been more medicinal than dietetic. It is extensively cultivated in Europe, from which country our supplies come. The two varieties, white and black, also commonly called yellow and brown, or English and German, when prepared, are distinctly different in composition and flavor.

Paradise Grains are an extremely pungent seed, very small and very hard. Under the name of Melegueta Pepper and Guinea Grains it was used for centuries in Europe as a stimulating condiment. It still comes from its original habitat along the Gold Coast of Western Africa.

Pepper, black and white, is the fruit of a tropical vine. It was one of the earliest used and most highly esteemed of spices and for centuries was the staple article of trade between Europe and India. It was the medium of exchange when money was scarce in some periods in Europe. At one time it was heavily taxed, the figure reaching over $1 a pound in England during the seventeenth century.

The black pepper is the immature or unripe berry, the white pepper is the same fruit allowed to mature on the vine. During this process of maturing its color changes and a different flavor develops which is attractive to some and disagreeable to other persons.

Some commercial varieties of white pepper are made by decorticating the commercial black pepper and then grinding the lighter colored inner portions of the fruit. This is expensive, but is esteemed very highly for use when the black specks of the ordinary black pepper would be objectionable.

Long pepper is a different fruit altogether, although coming from the same genus of plants. It is inferior in flavor and only found rarely in commerce and then as an adulterant at times. The world's supply of pepper comes from Malabar, Sumatra and Singapore.

Sage, savory and *thyme* are aromatic herbs used in cooking and seasoning meats particularly. They are all cultivated in Europe and our supplies come from that country. The fresh herbs, sold as "pot herbs" are grown in this country, usually by the farmers themselves, who bring them to market tied up in little bunches.

Star Anise is an anise-flavored curious fruit from China, rarely used as a spice, but frequently as a source of the volatile oil of anise.

Tarragon is an herb used principally for giving a characteristic flavor to vinegar. It comes from Europe.

And here we bring to a close our story of spices—a story which has reached back through days of daring and adventure when it meant something to have a "ship come home"; a story which has in it more of intrigue and treachery than of altruism or Christian spirit; a story which brings vividly to our minds pictures of Poseidon's Seven Seas, of monsoon-whipped tropical jungles, of "elephants a pilin' teak," of lines of spice laden camels with "their silly necks a bobbin' like a basket full of snakes."

Here is material for bard, historian, novelist, sculptor, painter or musician. Each decade furnishes inspiration for an epic, each century details for a ponderous tome of interest and fascination rarely equaled. The high lights only have been shown. In the shadows lies material for the future, and the seeker has reward enough in the search whether he has hearers or whether he has not. Selah!

CAFFEINE AND SODIUM BENZOATE.

A Puzzle Unravelled.

J. Rosin.

For the determination of sodium benzoate in Caffeine and Sodium Benzoate the U. S. P. directs to use the general method given in Part II for the assay of alkali salts of organic acids. In this method of assay the compound is carbonized by moderate ignition, the carbonized mass disintegrated, boiled with a measured excess of half normal sulphuric acid and excess of acid titrated with half-normal alkali hydroxide, methyl orange indicator.

With Sodium Benzoate alone this method of assay is almost invariably several per cent. low, because the fused carbon envelopes alkali-carbonate and which is not penetrated by boiling with the acid. But with Caffeine and Sodium Benzoate the results are good and sometimes "too good." The sum of anhydrous caffeine and sodium benzoate in the moisture free compound is nearly 100 per cent. and frequently a little over.

Correct results with sodium benzoate alone are readily obtained by applying a modification suggested by Elvove. After boiling the carbonized mass with sulphuric acid, filtering and washing free of acid, the carbon residue together with the filter is ignited and the residue added to the acid. This operation "liberates" the sodium carbonate occluded by the carbon. Using this modification with Caffeine and Sodium Benzoate the results for sodium benzoate are several per cent. too high, the sum of the Caffeine and Sodium Benzoate in the moisture free compound amounting to 103 per cent. or even more.

How is it possible? Where is the extra alkalinity derived from? From the crucible? Platinum is used. From the air? Perhaps.

Again, when Caffeine and Sodium Benzoate is assayed for sodium benzoate by ignition with sulphuric acid and weighing the resulting sodium sulphate normal results are obtained, the sum of the Caffeine and Sodium Benzoate amounting from 99 to 99.5 per cent. And it will be remembered that this method of assay includes all fixed impurities such as sodium chloride, of which a few tenths of one per cent. is generally present, as Sodium Benzoate.

Similar though slightly lower results are obtained when the benezoic acid is isolated and titrated.

The following is an illustration from an actual test of a sample of a moisture free Caffeine and Sodium Benzoate.

Caffeine Anhydrous,	49.0%
Sodium Benzoate by titration of the Benzoic Acid,	49.5%
Sodium Benzoate by ignition with sulphuric acid,	50.2%
Sodium Benzoate by U. S. P. assay,	54.0%

For a little while we were very much puzzled about this, but finally succeeded in formulating a theory which accounted for the abnormalities with the U. S. P. assay.

It is well known that when an alkali carbonate is ignited with nitrogenous matter, cyanide is formed. This was the basis for the commercial manufacture of potassium ferrocyanide and is probably still being practiced to some extent. Under suitable conditions, alkali carbonate reacts with gaseous nitrogen forming cyanide. Now caffeine contains plenty of nitrogen, and sodium benzoate when heated yields sodium carbonate. An excellent opportunity to form cyanide! And it does.

But how will the formation of cyanide account for the high results? Let us see what happens further. When a cyanide is heated with water and especially in the presence of an acid, hydrocyanic acid is formed which on further heating is hydrolyzed to ammonia and formic acid, thus:

$$HCN + 2H_2O = HCOOH + NH_3$$

This explains it. In addition to the sodium the ammonia formed through the hydrolysis of the hydrogen cyanide also neutralizes the sulphuric acid used in the assay. The greater part of the formic acid is driven off during the boiling and whatever remains in the solution is not completely neutralized with alkali when methyl orange indicator is used. The result is that in the back titration less alkali is consumed, thus indicating a higher sodium benzoate contents.

That this theory is correct can be readily proven. Ignite 1 or 2 gm. of Caffeine and Sodium Benzoate in a crucible at a low temperature, treat with water and filter. To a portion of the filtrate add a few drops of ferrous sulphate solution, a little sodium hyroxide, warm gently and render acid with hydrochloric, when a blue color or precipitate will be formed. To the remainder of the filtrate

add a slight excess of diluted sulphuric acid, boil for about 20-30 minutes and add an excess of alkali. Ammonia will be evolved.

The amount of cyanide formed is variable, depending on the initial temperature of heating of the Caffeine and Sodium Benzoate and is probably influenced by some other factors, but cyanide is invariably formed.

From the above it is quite evident that the U. S. P. method for alkali salts of organic acid is inapplicable for the evaluation of the Sodium Benzoate content in Caffeine and Sodium Benzoate.

A satisfactory, though probably slightly too high test, is given by ignition with sulphuric acid and weighing the resulting sodium sulphate.

A convenient process for the determination of the sodium benzoate is that of Lang for alkali salts of insoluble organic acids. A weighed quantity of the salt dissolved in water in a separatory funnel is treated with a measured volume of standard acid, the liberated benzoic acid extracted with chloroform, which is discarded, and the excess of sulphuric acid in the aqueous solution titrated with standard alkali, using methyl orange or phenolphthalein indicator. This method of assay yields good results, provided no other acid consuming substance such as alkali carbonate or bicarbonate is present.

Although it generally yields about 0.5 per cent. lower values, we prefer the direct determination of the Benzoic Acid because it is *direct*. It gives the actual benzoic acid, is not affected by carbonate, etc., and is performed with the same sample in which the caffeine is determined. As we practice it, about 1 gm. of the caffeine and Sodium Benzoate, previously dried to constant weight, is dissolved in 20 cc. of water, 5 cc. of sodium hydroxide T. S. added, the caffeine extracted with chloroform, the chloroform evaported and the caffeine weighed. The aqueous liquid is next treated with an excess of diluted sulphuric acid, the liberated benzoic acid extracted with chloroform, the chloroform solution evaporated at a very low temperature in an Ehrlenmeyer flask to a few cc. mixed with about 30-40 cc. of diluted alcohol and titrated with tenth-normal alkali or barium hydroxide.

Powers-Weightman-Rosengarten Co.

THE EVOLUTION OF CHEMICAL TERMINOLOGY. V. SOME ALCHEMICAL TERMS.

By James F. Couch.

The accompanying list is a collection, from scattered sources, of a number of names used by the old alchemists to designate some of the compounds with which they were familiar. A great portion of these names is today unintelligible to the average chemist and the list is published in order that it may be recorded in an accessible place. From time to time one of these old names presents itself in an old formula, an account of travel or adventure in the eighteenth century, or in some commercial event and while the well-read chemist would, without much difficulty, guess the modern equivalents of such names as "galactic acid," "blue copperas," or "fixed salt of tartar," no amount of speculative mental activity would translate for him "gilla vitrioli," "heavy stone," or "lilium of Paracelsus."

The list shows graphically how much the alchemists must have suffered from their cumbrous and unsystematic terminology and the great indebtedness of modern chemistry to de Morveau and Lavoisier for bringing order out of chaos with their excellent method of nomenclature. No one can expect extensive and rapid advance in theoretical chemistry from an age which referred to magnesium carbonate with the several names, "aerated magnesia of Bergman," the "powder of Santinelli," the "powder of the Count of Palma," and "white magistery." Such a variety of totally unrelated names for the same substance was certain to bewilder the neophyte, submerge the amateur, and to overtax the mind of the master. While many of the names appear rational, when the circumstances of their origin are considered, some are quite whimsical, *viz.*, coral arcana, Juan Blanca, philosopher's oil, spirit of Venus; others are exasperatingly misleading: "Seidlitz salt" is not an alkali tartrate at all but is a synonym for homely Epsom salt; "marine alum" contains neither sodium nor suphates, but is aluminium chloride; "English salt" is not what it appears to be but is ammonium carbonate; "foul air" is nitrogen; "phlogisticated alkali" is the ferrocyanide of potassium; instead of terming hydrogen sulphide water "stygian water" that term is applied to nitro-hydrochloric acid; and the "secret salt of Glauber" which, of course, we readily guess (wrongly) turns out to be am-

monium sulphate. But what can be expected of an era that called sodium acid phosphate "pearl acid"?

The list follows. Well known alchemical names, such as Epsom salt, Glauber's and Rochelle salts, which have survived and are in use at the present time, are not included. The list is not presented as complete for there are, doubtless, a great many terms which have not been included, some of which may even be untranslatable by modern chemists.

A

Acete martial,	acetate of iron
Acid of sugar,	oxalic acid
Acid spirits,	dilute acids
Acidulated waters,	waters impregnated with carbon dioxide
Aerated iron,	ferrous carbonate
Aerated magnesia of Bergman,	magnesium carbonate
Aerated mineral alkali,	sodium carbonate
Aerated vegetable alkali,	potassium carbonate
Aerated water,	solution of carbon dioxide
Aerial acid,	carbon dioxide
Alkaline gas,	ammonia
Antimony snow,	sublimed antimony oxide

B

Barote,	barytes
Barytic chalk,	barium carbonate
Barytic liver of sulphur,	barium sulphide
Base of marine salt,	sodium hydroxide
Base of vital air,	oxygen
Black magnesia,	manganese dioxide
Blue copperas,	copper sulphate
Bitter cathartic salt,	magnesium sulphate

C

Calcarious borax,	calcium borate
Caustic marine alkali,	sodium hydroxide
Caustic mineral alkali,	sodium hydroxide
Caustic volatile alkali,	ammonium hydroxide
Chalk of lead,	lead carbonate

Chalk of soda,	sodium carbonate
Chalky acid,	carbon dioxide
Chalky ammoniac,	ammonium carbonate
Concrete volatile alkali,	ammonium carbonate
Coral arcana,	red mercuric oxide
Cream of chalk,	calcium carbonate
Crude antimony,	antimony sulphide

D

Dephlogisticated air,	oxygen
Dephlogisticated nitrous acid,	nitric acid
Diaphoretic antimony,	antimony oxide
Duobus salt,	potassium sulphate
Duplicated arcana,	potassium sulphate

E

Effervescent barote,	barium carbonate
Empyrée,	oxygen
English salt,	ammonium carbonate
Ethiops martial,	black oxide of iron
Ethiops mineral,	black mercuric sulphide

F

Fire air of Scheele,	oxygen
Fixed sal ammoniac,	calcium chloride
Fixed salt of tartar,	potassium carbonate,
Fixed vegetable alkali,	potassium carbonate,
Foul air,	nitrogen
Fuming liquor of Boyle,	ammonium hydrosulphide
Fuming liquor of Libavius,	stannic chloride
Fuming spirit of nitre,	nitrous acid

G

Galactates,	lactates
Galactic acid,	lactic acid
Gas of chalk, acid,	carbon dioxide
Gilla vitrioli,	zinc sulphate
Green coperas,	ferrous sulphate

H

Heavy borax,	barium borate
Heavy stone,	calcium tungstate
Hepars,	sulphides
Hepatic waters,	sulphurated waters
Horn tin,	stannous chloride

I

Infernal stone,	fused silver nitrate
Inflammable air,	hydrogen
Iron of water (Fer d'eau),	Iron phosphate

J

Juan Blanca,	platinum
Jupiter,	tin

L

Lilium of Paracelsus,	alcoholic potash
Livers of sulphur,	alkaline sulphides

M

Magistery of bismuth,	basic bismuth nitrate
Magistery of lead,	lead hydroxide
Magistery of sulphur,	precipitated sulphur
Malusic acid,	malic acid
Malusites,	malates
Marine alum,	aluminium chloride
Mephitic acid,	carbon dioxide
Mephitic ammoniac,	ammonium carbonate
Mephitic tartar,	potassium carbonate
Mercurial water,	solution of mercuric nitrate
Milk salt,	lactose
Mineral bezoard,	antimony oxide
Mineral crystal,	a mixture of potassium nitrate and sulphate

N

Nitrous alum,	aluminium nitrate

P

Pearl acid,	sodium acid phosphate
Philosophers' oil,	any fatty empyreumatic oil
Philosophers' wool,	sublimed zinc oxide
Phlogisticated air,	nitrogen
Phlogisticated alkali,	potassium ferrocyanide
Phlogisticated nitrous acid,	nitrous acid
Phosphorus of Baudouin,	anh. calcium nitrate
Phosphorus of Homberg,	anh. calcium chloride
Phosphorus of Kunkel,	phosphorus
Prismatic nitre,	potassium nitrate
Prussian gas,	gaseous hydrocyanic acid
Powder of the Count of Palma,	magnesium carbonate
Powder of Santinelli,	magnesium carbonate

Q

Quadrangular nitre,	sodium nitrate

R

Red arsenic,	realgar, arsenic disulphide
Regal salt of gold,	gold chloride
Regal salt of platinum,	platinic chloride
Regulus,	the metallic state

S

Salt of Jupiter,	stannous chloride
Salt of Saturn,	lead acetate
Salt of Segner,	potassium sebate
Scheidschutz salt,	magnesium sulphate
Secret salt of Glauber,	ammonium sulphate
Sedative acid,	boric acid
Sedative salt,	boric acid
Sedlitz (Seidlitz) salt	magnesium sulphate
Selenite,	calcium sulphate
Spathic ammoniac,	Ammonium fluoride
Spathic lead,	lead carbonate
Spirit of sal ammoniac,	ammonia
Spirit of salt,	hydrochloric acid
Spirit of Venus,	acetic acid

Spirit of vitriol,	sulphuric acid
Stinking air of sulphur,	hydrogen sulphide
Stygian water,	nitro-hydrochloric acid
Sulphurous salt of Stahl,	potassium sulphite
Sylvius' febrifuge salt,	potassium chloride
Syrupus acid,	pyromucic acid

V

Vegetable borax,	potassium borate
Vegetable salt,	potassium acid tartrate
Venus crystal,	copper acetate
Vitiated air,	nitrogen
Vitriolic acid,	sulphuric acid
Vitriolic acid gas,	sulphur dioxide
Volatile alkaline liver of sulphur,	ammonium sulphide

W

Water of Prussian chalk,	calcium cyanide
White calx of arsenic,	arsenious oxide
White copperas,	zinc sulphate
White magistery,	magnesium carbonate

THE CHLORINE ANTISEPTICS, WITH SPECIAL REFERENCE TO THEIR PHARMACEUTICAL STATUS.

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Some recent experiences have led the writer to suspect that there is, in the minds of many pharmacists, more or less confusion regarding that group of substances commonly known as the chlorine antiseptics. That others are of the same opinion is evidenced by the fact that the AMERICAN JOURNAL OF PHARMACY comments on the subject in an editorial in a recent issue.[1] In this paper we have endeavored to clarify the situation somewhat by very briefly outlining the things which the pharmacist should know regarding this most

[1] *Am. Journ. Pharm.*, Feb., 1922; Ed,

useful group of antiseptics. No attempt is made to go into detail as to the clinical aspect of the matter, as a journal of this character is not the place for such a discussion. Furthermore, no claim is made for the originality of the subject matter presented, as practically all of it may be found in the previously published work of Dakin,[2] Sweet,[3] Lee,[4] and others, but as such articles do not commonly reach the pharmacist, it seems that such a communication as this is justified.

The antiseptic value of chlorine has long been a matter of common knowledge, and such familiar preparations as "Labarraque's Solution," "Javelle Water," etc., have had a restricted field of usefulness for many years. The disadvantage of these and other chlorine containing preparations resides in the fact that while of unquestionable antiseptic value, they are irritant to such a degree as to make their use in open wounds and on mucous membranes, impossible. It was not until Dakin published his papers in 1916, on the action of chlorine on amino acids, proteins, etc., and the preparation of various synthetic chloramines, that we had any chlorine containing antiseptics suitable for such purposes. In most respects the action of these compounds is essentially the same, though each possesses certain properties which render it more or less suitable for particular purposes, a fact which is too often lost sight of by those who, for commercial reasons, indiscriminately recommend one preparation as embodying all the virtues of the group.

The antiseptics of the chlorine group most commonly employed in the treatment of infection are the following:

1. Dakin's Solution: The common name of the neutral solution of sodium hypochlorite, prepared according to the technique originated by Dakin.
2. Chloramine-T: The abbreviated name of sodium-toluene-sulphonechloramine.
3. Dichloramine-T: The abbreviated name for toluene sulphonedichloramine.

A brief description of each is given below.

[2] *British Med. Journ.*, Jan., 29, 1916; *Proc. Roy. Soc. B.* 89, p. 222, 1916; *Biochem. Journ.*, June, 1917.

[3] *Journ. Am. Med. Ass. LXIX*, No. 1, 1917, July 7th, p. 20.

DAKIN'S SOLUTION: This preparation is a solution of sodium hypochlorite, containing 0.45 to 0.5 per cent. NaClO, made in such a way that it is, and remains, neutral. The original directions called for the use of boric acid for neutralization, but it was later shown that it was possible to prepare a satisfactory solution without boric acid, if sodium bicarbonate be used in conjunction with sodium carbonate for decomposing the bleaching powder. The detailed technique should be known by this time to every pharmacist, and will be omitted here. The point that we wish to emphasize is that when Dakin's Solution is ordered, Dakin's Solution should be dispensed, and should be made in accordance with Dakin's directions, and not by some other method which happens to be less difficult. Such procedure as the latter frequently results in the failure of the preparation to give the desired results. A recent investigation into the methods of the preparation in drug stores, selected at random, revealed the astonishing and regrettable fact that in many, the solution dispensed when Dakin's was called for, was a two per cent. solution of chloramine-T. Recently several preparations have made their appearance upon the market, under various trade names, all claiming to be a concentrated solution of sodium hypochlorite, and for which it is claimed that they afford a rapid and easy method for the preparation of satisfactory Dakin's solution. It is also claimed that when using these concentrated solutions no testing is required. A word of caution is needed in this connection, namely, that observations made on a number of samples of these preparations, all bearing the same date on the label, revealed the fact that the strength of the solution was not by any means constant; if these solutions are used, the same care in determining the strength and the neutrality of the final preparations should be observed as in preparing Dakin's solution by the original method. It further should be borne in mind that the solution is of a definite strength, *i. e.*, 0.45 per cent., and that it has been shown that solutions of a concentration greater than 0.5 are irritating, and that those of less than 0.4 per cent. are ineffectual. As to the stability of Dakin's solution, the safe rule is that the solution should not be kept for more than three days.

CHLORAMINE-T: This is a crystalline, odorless substance containing 12.6 per cent. of chlorine. It is readily soluble in water, and the solutions are stable, exposure to light and heat not causing any

appreciable change. This antiseptic is usually employed in 2 per cent. solution, although stronger solutions have been used. It may also be used in the dry state as a dusting powder, or as an impregnation of gauze, and in a cream-like paste. None of the chlorine preparations are used in the ordinary fat or oil bases, as these rapidly withdraw the active chlorine, with the formation of inert compounds. The paste referred to is usually made by dissolving 1 per cent. of chloramine-T in water containing 5 to 10 per cent. of sodium stearate. Chloramine-T is a very good antiseptic, and possesses certain advantages which the hypochlorite solution does not. Chief among these is the fact that it is not as irritant. However, a solution of chloramine-T is not Dakin's solution; neither is there any justification for regarding such a solution as "improved Dakin's solution" simply because it was introduced by Dakin, for chloramine-T has never replaced the hypochlorite solution in clinical surgery, the two having totally different fields of application. Chloramine-T, being less irritant, may be used on mucous membranes, as the nose, throat and urethra, but its dissolving action on necrotic tissue is negligible. As it is for the sake of the latter action that Dakin's solution is most frequently desired by the surgeon, the responsibility of the pharmacist in this connection is clear.

DICHLORAMINE-T: This is a yellowish white, crystalline substance with a sweetish, pungent, chlorous odor. It is stable in the solid state. It is practically insoluble in water, but soluble in most of the organic solvents except paraffin or petroleum. The original solvent employed for Dichloramine-T was chlorinated eucalyptol, but the solvent of choice is now the chlorinated paraffin worked out by Dakin, and called by him "Chlorcosane." The antiseptic is used most commonly in either 1 or 5 per cent. solution. In making the solution it will be found most convenient to dissolve the dichloramine-T in about one-third of the amount of chlorcosane, heating gently, and adding the balance when slution has been effected. It has been suggested that the crystals be moistened first with an equal weight of chloroform, these crystals then readily dissolving in chlorcosane. Dichloramine-T solutions are not stable, being decomposed by light, moisture and on standing. For this reason only small amounts should be made up at a time, and the solution should be prepared fresh for each order. Amber bottles, preferably glass-stoppered, should be used, and any solution which shows clouding

or precipitation should be discarded, as should also solutions having the odor of hydrochloric acid. As a general rule, these solutions will not keep well for longer than forty-eight hours.

None of the above facts are new to pharmacists except the one point upon which we wish to lay special emphasis. The three chlorine compounds originated by Dr. Dakin, and bearing his name, do not have the same effect upon wounds. No confusion has arisen between the watery solutions and the solution of dichloramine-T in oil. Of the two watery solutions chloramine-T does not exert the desired solvent action on necrotic tissue, and has never been regarded as doing so by surgeons. Its chief practical use is as a disinfectant for drinking water. A prescription for Dakin's solution means only a solution of sodium hypochlorite of proper chlorine value and of proper neutrality.

257 South Twenty-first Street.

ABSTRACTED AND REPRINTED ARTICLES

NOTE ON SULPHURIC ACID MANUFACTURE.*

Sulphuric acid is manufactured industrially from native sulphur, or from pyrites, FeS_2, or, as a by-product in the metallurgy of the sulphide ores of copper and zinc.

In the earlier period of the Lead Chamber Process, native sulphur was practically the sole source of sulphuric acid, and was, at that time, obtained mainly from the Silician sulphur mines. Indeed, for many years, Italy was the chief exporter of sulphur in the world. But the development of the Frasch Process, which involves melting the sulphur *in situ*, and forcing it out through a tube by means of compressed air, led to the exploitation of the large sulphur deposits in Louisiana and Texas, and placed our own country in the first rank in the production, and also in the exportation of sulphur.

The production of Sicilian sulphur reached its maximum in

*Including statistical data from *Commerce Monthly*, as furnished by Dr. Richard V. Mattison.

1905, when it amounted to 560,000 tons. In 1921 it had fallen to one-half this quantity, while the exportation of American sulphur in the first nine months of 1922 reached 400,000 tons, and the amount consumed in domestic manufacture exceeded the sulphur exported.

It is estimated that about one-half of the sulphur deposit of Sicily has been mined. The mining in that country is becoming more and more costly, not only because of the depths reached in the operations, but also because of the higher cost of labor, the scarcity of fuel, and the greater cost of machinery.

The Frasch process, upon which the United States patent has now expired, cannot be used in Sicily, because the sulphur does not occur pure, or nearly so, as in the Louisiana deposit, but is associated with much gypsum and limestone. It may be mentioned at this point that the American sulphur is usually above 99 per cent. pure, and its impurity is not solid, but is a petroleum-like oil, which does not interfere with the compressed air process employed in forcing the molten sulphur up from great depth, through a tube.

Italy still exports sulphur—but mainly to supply the vineyards of Southern Europe, for the manufacture of sprays. Japan, also, is a sulphur-exporting country, and prior to the opening of the Panama Canal, our country consumed 45 per cent. of Japan's exports in this important commodity, mainly in the paper-pulp industry in our Pacific Coast States. These markets also have been captured by the American product.

The Lead Chamber Process for the manufacture of sulphuric acid contemplated, at the outset, the use of native sulphur, and for a long period it was used extensively in the manufacture of this most important acid. But about 1838 a French company acquired the monopoly of the Sicilian sulphur industry, and boosted the price to a point which made economically practicable the use of pyrites in place of elementary sulphur, despite the extra labor and cost of manufacture. But the lowered cost of native sulphur, due to the competition of the American sulphur industry, together with the high purity of this product, is again swinging the pendulum back to the use of the substance for which the Lead Chamber Process was originally devised. Thus, in 1914 less than 3 per cent. of the sulphuric acid output of this country was obtained from free sulphur, while about 74 per cent. was obtained from pyrites, largely from ore imported from Norway and from Spain. Four years

later, only about 28 per cent. of the acid output was from pyrites, while the free sulphur supplied 48 per cent. The amount supplied by zinc and copper ores remained practically the same, about 24 per cent., which is readily understood when it is remembered that here the acid is a by-product, and may be expected to keep step with the expansion of the zinc and copper industry.

In 1920 there were 204 plants in this country manufacturing sulphuric acid, distributed over thirty-two States, but the larger ones located near the industrial centres, particularly in New Jersey, Pennsylvania and Maryland. The total output for this year totaled five and a half million short tons of 62 per cent. acid, and about a half million tons of stronger acid. The wide distribution of the sulphuric acid plants is due principally to the fact that the corrosive nature of the acid tends to add to the cost of transportation, and to make long hauls the exception rather than the rule, it being more practicable to ship the sulphur to the industrial areas where the acid is consumed than to ship the finished product—the corrosive acid.

From the industrial standpoint sulphuric acid is the most important of all chemicals, for it enters, directly or indirectly, into the manufacture of countless products; but more is used for the manufacture of chemical fertilizers than for any other commodity. The so-called chemical industries require great quantities, as might be expected; steel pickling, galvanizing, petroleum refining, storage batteries, fabrics, paint and glass, also consume much sulphuric acid.

The price of sulphur and of sulphuric acid has recovered from the war time inflation, and will, in all probability, present but minor fluctuations during the next half dozen years. In other words, the industry is fairly well stabilized.

SILVER SALVARSAN.

By W. H. Gray, M. Sc.

The following is an advance abstract of a paper on this subject read at the meeting of the Chemical Society of London, England, on Thursday, March 1:

This drug is the outcome of an observation made by Ehrlich in 1913 that salvarsan had the property of forming with salts of the

heavy metals, complex compounds, in which the metal no longer exhibited its usual ionic reactions, thus the silver-salvarsan complex can be converted into a sodium derivative readily soluble in water and suitable for injection and it is in this form that silver salvarsan has come into use for treating highly resistant late stages of syphilis, especially in Germany and the United States, and its use has lately been advocated by one or two syphilologists in England.

The view that silver-salvarsan and its analogues are actual co-ordination compounds in which the metals are held by residual valencies of either the tervalent arsenic or nitrogen atoms in salvarsan has been advanced by the German workers Ehrlich, Jarrer and Binz, but it has also been suggested that the metal is not combined with the salvarsan in sodium silver salvarsan, but is present merely in colloidal form, and on addition of the drug to water becomes dispersed, forming a solution of colloidal silver (or one of its salts) in a solution of sodium salvarsan. The results of the present investigation show that this latter view of the constitution of the drug is the correct one and that the same is true of silver-salvarsan itself. It is found for example that all the silver is removed from solutions of silver salvarsan or sodium silver salvarsan by the addition of picric acid, owing to the simultaneous precipitation of the salvarsan as a picrate insoluble in water but soluble in acetone. By extraction of the precipitates with cold acetone a residue of colloidal silver chloride or oxide, insoluble in water but soluble in alkaline liquids is obtained. Confirmation was afforded by fractional precipitation by ether of solutions of silver salvarsan and sodium silver salvarsan in methyl alcohol, when first fractions rich in silver were obtained.

Analyses of commercial sodium silver salvarsan show that the amounts of silver and arsenic present do not conform with those required for a well-defined co-ordination compound and thus lend support to the view that the composition of the drug though constant is accidental.

WELLCOME CHEMICAL RESEARCH LABORATORIES,
London, England.

A HUNDRED YEARS AGO.*

By George Nox McCain.

Within one hundred years immigrants arriving at the port of Philadelphia went West in wagons. They were rated practically as cattle. Conestoga wagons carried them to their destination. The newcomers were packed in like sardines. They paid the wagoners $5 a hundredweight for transporting them. It was the same rate charged for freight. Fat men, like fat cattle, were the most valuable from the teamster's viewpoint. It required from five to seven days to go from Philadelphia to Pittsburgh. The roads were horrible and the wagons had no springs. Twenty dollars was the fare from city to city. That was back in 1820-25.

Dr. Joseph W. England has just compiled one of the most valuable and interesting historical works of recent years. It is not merely the chronological record of an institution; it is, at the same time, a narrative story of a century's growth of this city. "The First Century of the Philadelphia College of Pharmacy" is its title. It is from this work that the above historical facts were gleaned. Associated with Dr. England in the preparation of his work was a distinguished committee selected from the officers and faculty of the college. They were Dr. Charles H. La Wall, Robert P. Fischelis, Charles A. Weidemann, M. D., Samuel P. Sadtler, Freeman P. Stroup, Julius W. Sturmer and E. Fullerton Cook. Brilliant sidelights on Philadelphia and pharmacy of a century ago are found in its pages.

Philadelphia as a city of "firsts" has been stressed for years. As a direct outcome of its early cultural influences it became noted as the place where the reprinting of the Bible and of Shakespeare's works was first undertaken; where the first protest against slavery was promulgated; the first drug mill was started here and the first botanical garden planted; the first American hospital opened its doors in this city; the first mint and the first daily newspaper were

*Reprinted from the *Philadelphia Public Ledger.*

established in Philadelphia, and here in 1821 the first college of pharmacy on the Western hemisphere was established.

What has made the work of Dr. England and his associates particularly attractive is the narrative style adopted in telling the story of the past of the city and the college. In 1821, when the druggists and apothecaries of this city were formulating the plans for the establishment of a college of pharmacy, strange sights were witnessed on our main thoroughfares. High Street (now Market) and the side streets, where the taverns were mostly located, were choked with the lumbering Conestoga wagons. They came in from north, south and west. They brought in grain, smoked meat, dried vegetables, whisky, lard, wool and lumber. Going back they carried cloth, hardware, salt, iron, paint, tobacco and imported liquors. There were sixty-one stage and wagon taverns on the pike between Philadelphia and Lancaster. Droves of livestock filled the streets of the city and suburbs at times. To be a stage driver one had to be as expert as an automobilist today to dodge in and out and between the scores of freight wagons on the road. At the taverns everybody ate and drank in a hurry to get away.

We of today are prone to regard the life of a hundred years ago as slow, dreamy and sedate. It was swift as the swiftest, on the road at least! As many as thirty coaches, each drawn by four horses, stopped at one of these taverns in a single day. Going up the mountains six horses were attached to each coach. The Conestoga wagons were usually drawn by four horses. As many as eight were hitched to the largest.

Freight intended for St. Louis, then a drowsy town of 4500, went by the Ohio River. It was hauled by wagon from Philadelphia to Pittsburgh and there loaded on barges. Boatmen floated the barges to St. Louis and other Mississippi settlements. Then they continued down to New Orleans and came back to Baltimore and Philadelphia on ships. Going north and south travelers were aided by the rivers. The principal travel was by sailing packets. Steamboats came later. Passengers for Baltimore sailed down to New Castle, Del. They boarded a stage coach there and were carried sixteen miles across the peninsula, where they took another packet at

Frenchtown, on the Elk River, for their destination. The trip to New York, when it was not made by coach throughout, involved a packet trip up to Bordentown. There a coach was taken to New Brunswick on the Raritan River or to Elizabethtown Point or South Amboy. Here packets waited to carry the traveler to New York. Oddly enough, the fare for the trip was as low as $3. Today it is considerably higher.

In the history of pharmacy in Philadelphia the name of Elias Durand stands out prominently. Dr. England points out that this clever Frenchman was a pharmacien of the Grand Army of Napoleon. After the "little corporal's" final abdication and exile to St. Helena Durand came to America, and ultimately to Philadelphia. At the southwest corner of Sixth and Chestnut Streets, now the site of the *Public Ledger* Building, he established the finest drug store in this city. The building in 1825 was a three-story brick, with a cigar store next door. He was the first individual, from all accounts, to introduce "soda water" to Philadelphia. History of the day says: "With French glassware and drugs and chemicals imported from France and novel apparatus for making and vending cooling water charged with carbonic acid gas, his shop became a favorite resort for many of the leading physicians of the city and surrounding country."

General William C. Braisted, tenth president of the College of Pharmacy and Science, under whose administration the history of this college has been written—it is not generally known—was attending physician at the White House on President Roosevelt. He is, by reason of experience and service, the most distinguished head the college has ever had. He was fleet surgeon of the Atlantic fleet from 1912 to 1914. In 1913 he was elected president of the Association of Military Surgeons of the United States. Upon him fell the entire responsibility for not only the personnel but the surgical and medical duties of the American Navy in the World War. He is one of the two Philadelphians decorated with the Order of the Liberator by the Government of Venezuela for services in the battle of Puerto Cabello.

SOLID EXTRACTS

The key has been turned in the lock of the atom and science is peeping inside. And sitting in majesty and positive possession on the inner throne of every atom is hydrogen, the king. Einstein is right—the understanding of today was the mystery of yesterday and will be the joke of tomorrow.

Saccharin, the artificial sweetening substance used largely during the war and by persons suffering from diabetes, retards the digestion when taken in small amounts over a long period and affects injuriously the functions of the kidneys when taken in greater amounts, according to Dr. A. J. Carlson of the University of Chicago.

The death rate from typhoid fever continues to decline in the larger cities and for the year 1922 was at the lowest point on record, according to the eleventh annual summary of the deaths from the disease published by the American Medical Association on the basis of official reports from all cities of 100,000 population or more. The total population of these cities, 69 in number, somewhat exceeds 28,000,000, and the total number of typhoid deaths reported was 953, or at a rate of 3.3 per 100,000.

Compared with this were rates of 4.0 in 1921 and 8.1 in 1916.

Pliny, in writing about how his aged friend, Spurinna, keeps his youthful vigor, says:

"When the baths are ready, which in winter is about three o'clock, and in summer about two, he undresses himself; and if there happens to be no wind, he walks about in the sun. After this he puts himself into prolonged and violent motion at playing ball; and by this sort of exercise he combats the effect of old age."

"Nothing new under the sun." Barton, the Philadelphia botanist of a century ago, writes in his "Flora," that plant pollen undoubtedly contains much potential material, which is probably responsible for the American catarrhs, and that a further study of this plant material might bring to light valuable information concerning the diagnosis and cure of that perinicious malady. And so Barton anticipated by more than a century the modern doctrine of anaphylaxis and protein idiosyncrasies.

The latest treatment for bichloride of mercury poisoning is the quintescence of simplicity and deserves careful consideration. By mouth, calcium sulphide grains 2 to 5, every two hours, until an excessive amount is taken. Intravenously, calcium sulphide solution (fresh) 1 grain of calcium sulphide to 1 ounce of water, boiled and filtered through cotton or paper. The amount used should be a grain of calcium sulphide for each grain of the bichloride of mercury taken. This solution must be prepared fresh, as decomposition takes places when not used immediately. One intravenous injection is sufficient. Lavage of the stomach or local treatment is unnecessary.

If you can imagine a single grain of some substance divided into 600,000,000 parts, and one of these parts weighed accurately upon a balance, you will get some idea of the sensitiveness of the latest laboratory weighing machine.

This balance, devised by Hans Peterson, is an improvement on the delicate quartz balance made by two scientific men named Steele and Grant.

The beam of the balance is a small piece of quartz measuring less than 2 inches in length and weighing about a grain only. What would correspond to the pans in an ordinary pair of delicate scales are suspended from quartz threads a thousandth of a millimeter (one twenty-five-thousandth of an inch) in diameter.

The actual weighing is done by measuring the vibrations of the balance by means of a spot of light thrown upon a scale, which shows the actual movement of the balance enormously magnified.

Such refined weighing has to be done in a vacuum, and the instrument is mounted in a container, from which the air can be exhausted before the actual work commences.

The balance itself weighs about 3 grains and is sensitive to a ten-millionth of a milligramme.

According to a decree published in the *Monite ur Belge* and effective September 21, 1923, the marketing of medicines for external use in Belgium will be subject to the following new regulations:

Special red labels marked "Usage externe—Uitwendig gebruik," are required for medicines for external use. For such medicines the bottles, phials and flasks must be octagonal in shape, yellow-brown in color, and bear in relief on the glass itself the notice specified above. Medicines for internal use must not be delivered in bottles, phials or flasks of polygonal shape. These regulations, with the exception of the requirement in regard to the label, do not apply to such receptacles as contain more than a liter.

The nearest approach to the absolute zero temperature which has yet been attained has been recently achieved by Prof. H. Kamerlingh Onnes, of the University of Leyden, Holland, according to advices rereceived by the Bureau of Standards. The record temperature of 272.18 below zero Centigrade, or as the physicists express it, .82 degrees absolute, was reached by the Dutch scientist in an unsuccessful attempt to solidify liquid helium. The temperature is equal to approximately 458 degrees below zero Fahrenheit.

Chlorine gas, the gas used in the Great War as a weapon of offense, has been turned with effect against the germs of influenza. Prof. Harrison Hale, of the University of Arkansas reported the results of experiments made with students at that University to the Biological Chemistry Division of the American Chemical Society's recent meeting. The gas is not a cure but a preventive of the disease, he stated.

The gas was breathed in very dilute concentration as when at all concentrated it is corrosive and poisonous.

Ten thousand tons of talcum powder were used by the women in America during the last year, based on the latest figures from the U. S. Department of Commerce, says Frank K. Woodworth, head of the American Manufacturers of Toilet Articles.

If the tins necessary to hold ten thousand tons of face powder, each measuring four inches in length, were placed end to end, they would extend for a distance of 2147 miles, or from New York to Sante Fe, or from New Orleans, La., to Helena, Mont.

The clothes moth, which it is estimated destroys 10,000 tons of wool each year, may be absolutely controlled by the use of a new chemical called "Eulan F," which may be used in wool-finishing. The substance is harmless to human beings, but wool impregnated with it is not eaten by the larvæ of the moth, except when starvation threatens and it is then speedily fatal. The chemical has been prepared at the dye works of Leverkusen, by Dr. Meckbach and his collaborators.

The coagulation of the blood in cases of hemorrhage may be helped by the feeding of fibrinogen, a component of all animal tissues, to the wounded person, according to Dr. C. A. Mills, of the University of Cincinnati, who has presented a report of his work to the American Physiological Society. He found that fibrinogen, whiich is one of the three chief components of the blood clot, is absorbed directly in the intestines without chemical change and that the administration of it reduces the time of the formation of a blood clot from 15 to 6 minutes.

An extract of yeast that may take the place of insulin, the specific for diabetes, has been recently discovered by L. B. Winter and W. Smith in the Biochemical Laboratory at Cambridge.

Great similarity to the pancreatic extract for treating diabetes which was isolated last year at the University of Toronto has been shown by this newly discovered solid substance from yeast.

The production of an insulin substitute from yeast is considered a great step in advance for it is expected that it will greatly reduce the cost of preparation of an anti-diabetic drug. Insulin today is almost prohibitive in cost, since it is difficult to prepare and must be taken continually.

At a meeting of the Philadelphia College of Physicians and Surgeons, held February 26, 1923, there was a symposium on the treatment of pneumonia with Pneumococcus Antibody Solution, a product discovered by Dr. F. M. Huntoon, Medical Director of the Biological Laboratories of H. K. Mulford Company, Philadelphia.

The results obtained with this new product in the treatment of pneumococcus pneumonias have shown a large decrease in mortality, which, previous to the use of this treatment and in the control cases, average 30 to 35 per cent., whereas, in the cases treated with Pneumococcus Antibody Solution, the mortality rate did not exceed 16 per cent.

SCIENTIFIC AND TECHNICAL ABSTRACTS

NOMENCLATURE RULES ADOPTED BY THE NOMENCLATURE COMMITTEE OF THE AMERICAN CHEMICAL SOCIETY.—These rules have also been approved by the British Chemical Society. They have been adopted after a careful study to determine best usage and are compiled because of a feeling that uniformity in chemical nomenclature in the literature is very desirable.

The rules do not cover the field completely by any means; they are intended merely to cover some more or less general points on which usage has differed considerably.

1. In naming a compound so as to indicate that oxygen is replaced by sulfur the prefix *thio* and not *sulfo* should be used (sulfo denotes the group SO_3H); thus, HCNS, *thio*cyanic acid; H_3AsS_4, *thio*arsenic acid; $Na_2S_2O_3$, sodium *thio*sulfate; $CS(NH_2)_2$, *thio*urea. The only use of *thio* as a name for sulfur replacing hydrogen is in cases in which the sulfur serves as a link in compounds not suitably named as mercapto derivatives; thus, $H_2NC_6H_4SC_6H_4NH_2$, thiobisaniline. *Hyposulfurous acid,* not hydrosulfurous acid, should be used to designate $H_2S_2O_4$.

2. The word *hydroxide* should be used for a compound with OH and *hydrate* for a compound with H_2O. Thus, barium hydroxide, $Ba(OH)_2$; chlorine hydrate, $Cl_2.10H_2O$.

3. Salts of chloroplatinic acid as *chloroplatinates* (not platinichlorides). Similarly salts of chloroauric acid are to be called *chloroaurates.*

4. Hydroxyl derivatives of hydrocarbons are to be given names ending in *—ol,* as glycer*ol,* resorcin*ol,* pinac*ol* (not pinacone), mannit*ol* (not mannite), pyrocatech*ol* (not pyrocatechin).

5. The names of the groups NH_2 NHR, NR_2, NH or NR should end in *—ido* only when they are substituents in an acid group, otherwise in *—ino;* thus, MeC(:NH)OEt, ethyl im*ido*acetate; $NH_2CH_2CH_2CO_2H$, β-am*ino*proprionic acid (not am*ido*propionic acid); $NHPhCH_2CH_2CO_2H$, β-anil*ino*propionic acid; $CH_3C(:NH)CO_2H$, α-iminopropionic acid.

6. Hydroxy—, not oxy—, should be used in designating the hydroxyl group; as *hydroxy*-acetic acid, $CH_2(OH)CO_2H$, not *oxy*-acetic acid. *Keto*— is to be preferred to *oxy*— to designate oxygen in the group—CO—.

7. The term *ether* is to be used in the usual modern acceptation only and not as an equivalent of *ester*.

8. Salts of organic bases with hydrochloric acid should be called *hydrochlorides* (not hydrochlorates nor chlorhydrates). Similarly hydrobromide and hydriodide should be used.

9. German names ending in *—it* should be translated *—ite* rather than *—it;* as permut*ite*. If it seems desirable to retain the original form of a trade name it should be placed in quotations, as "Permutit." Alcohols such as dulcitol (German Dulcit) are exceptions.

10. German names of acids should generally be translated by substituting *—ic acid* for "—säure." Some well established names are exceptions, as Zuckersäure (saccharic acid), Milchsäure (lactic acid), Valeriansäure (valeric acid), etc. When the names end in "—insäure" the translator *may* substitute *—ic acid* unless another acid already bears the resulting name; thus, Acridinsäure, acridic acid, but Mekoninsäure, meconinic acid, because meconic acid (Mekonsäure) is different. Names ending in "carbonsäure" are to be translated —carboxylic acid (not —carbonic acid).

First Annual Report of the International Committee on Chemical Elements.—For a number of years an international committee was engaged in compiling data concerning revisions of atomic weight determinations, publishing annually a table of approved figures. This committee was appointed by the International Association of Chemical Societies, which was broken up by the war, and the operations of its committees temporarily suspended. After the war closed, the representatives of several of the nations that had been allied against the Central Powers formed the International Union of Pure and Applied Chemistry, which created a committee designated as the International Committee on Chemical Elements. The change of title and scope is rendered necessary by

the great progress in the field of isotopy, first recognized in connection with the radio-active elements, but now extended to many other groups. The duty of the committee will be to keep chemists informed of the progress of discovery in this promising field. It consists at present of eight members representing United States, Great Britain, France and Czecho-Slovakia. Germany and Austria have not yet been taken into the fold. In addition to constituent members the committee has special experts and two honorary presidents.

Under these auspices a first report has been issued containing tables of isotopes and radio-active elements. The committee considers that its work in this field is only provisional. Recognizing that the definitions and nomenclatures adopted are not homogeneous, the committee regards some changes as necessary, but, pending general approval, has made only a few modifications and has deemed it proper to submit these to the judgment of the discoverers. The names "radon," "actinon" and "thoron" were, therefore, submitted to Rutherford and Curie, and as these names are given in the tables, it is presumed that they have been approved.

The following definitions are taken from the report:

A chemical element is defined by its atomic number. This number represents the excess of positive over negative charges in the constitution of the atomic nucleus. Theoretically the atomic number also represents the number of electrons which rotate around the central positive nucleus of the atom. Each atomic number represents the place occupied by the element in the Mendeleef table. If the above definition is accepted, elements may be simple or complex, according as their atoms are all of the same mass or not. Complex elements consist of as many isotopes as the atoms have different masses, therefore, consist of a mixture of isotopes. All elements considered as units are represented by their standard symbol, but to represent isotopes, the symbol is modified by an exponent indicating the mass of the given isotope. In the English text, this exponent is written as a superior, for example, Cl^{35} refers to the chlorine isotope having the atomic mass of 35. In the French text (the report is bilingual) the isotope is represented by Cl_{35}. This is probably due to the fact that French chemists use the old form of exponent, written as a superior, and, therefore, just reverse the methods followed by all other nations, but this practice is slowly disappearing

and it is to be hoped that uniformity may be soon attained. In establishing the mass of the isotope, oxygen is as usual taken as 16. The isotopes of lead, which are the ultimate result of disintegration of radio-active elements and the radio-active isotopes will alone appear in the International Table of radio-active elements. The expression "atomic mass" is reserved for isotopes or simple elements considered from the isotopic point of view. The expression "atomic weight" retains its usual meaning, and is applied to elements without consideration of their isotopic constitution.

The pamphlet contains a table of over thirty elements, mostly the abundant ones, with several data, among which the most interesting is the statement of the number of isotopes so far elucidated. Lithium is the element of lowest atomic weight that is given as having isotopes, consisting of two with respective masses of 6 and 7. Boron has two, respectively, 10 and 11. Silicon is given two (28 and 29) with provisionally a third (30). Selenium is given six and tin seven with a possible eighth. Xenon is given seven with possibly two more. A large table is appended, giving the three series of radio-active elements, *viz.*, uranium-radium series, ending with radium omega prime, which is isotopic lead, the actinium series and the series of thorium, which last also ends with lead (Th omega, prime), but the lead terminating the radium series has a different atomic mass (that is, is a different isotope) from that ending the thorium series, the former being Pb^{206}, the latter, Pb^{208}.

An inspection of the table will show the extraordinary development that has taken place in the knowledge of the nature and properties of the chemical elements.—H. L.

MEDICAL AND PHARMACEUTICAL NOTES

Adulteration of Lime Water and Sweet Spirit of Niter. —In the report of the Food and Drug Division of the Massachusetts Department of Public Health, for the year ending November 30, 1921, it is stated that 45 per cent. of the samples of the sweet spirit of niter and 17 per cent. of lime water samples were found to be adulterated. Of the latter preparation a remarkable

story of criminality. A person complained to a druggist that the sample of lime water sold by the latter was not right because it did not have the expected action. The druggist asserted that the lime water was all right, took it back and threw it away. The complainant sent another person to the store, who purchased some of the preparation and took it to the Department, where it was found to be practically free from lime. An inspector of the Department then purchased a sample, which was also found to contain scarcely any lime. The druggist was convicted. The question arises what would lead a druggist to dispense such an article in such condition. Lime water can be made and kept with little trouble, but it appears that as a result of this case, numerous samples were collected throughout Massachusetts and many were found under strength. The report ascribes this condition to the practice of druggists keep- an excess of lime in the bottle and simply filling up with water from time to time. After a while much of the undissolved lime is converted into carbonate, and little calcium hydroxide is left to dissolve.

It is noted in the report that as regards most of the drugs now sold in Massachusetts, but little adulteration is detected, which condition is ascribed to the increased production of drugs by manufacturing pharmacists, which are responsible and also provided with scientific methods and control.—H. L.

Drowsy Blossoms Lead to New Anæsthetic.—Flowers that persisted in "going to sleep," curling up their petals when they should have been gaily blooming, were the clues to a new anæsthetic which Dr. A. B. Luckhardt and J. B. Carter tested successfully as a method of putting animals and men to sleep at the University of Chicago. The flowers were carnations and the gas is ethylene, a constituent of ordinary illuminating gas.

As far back as 1908 florists complained that carnations when placed in greenhouses would "go to sleep" and those which had not opened would fail to do so, causing great loss in their business. Investigation proved leaky gas fixtures to be the cause. Gas contains four per cent. of ethylene and it was shown that one part of this gas

in 2,000,000 parts of air caused already open flowers to close. Other investigations showed a similar effect of the gas on other plants.

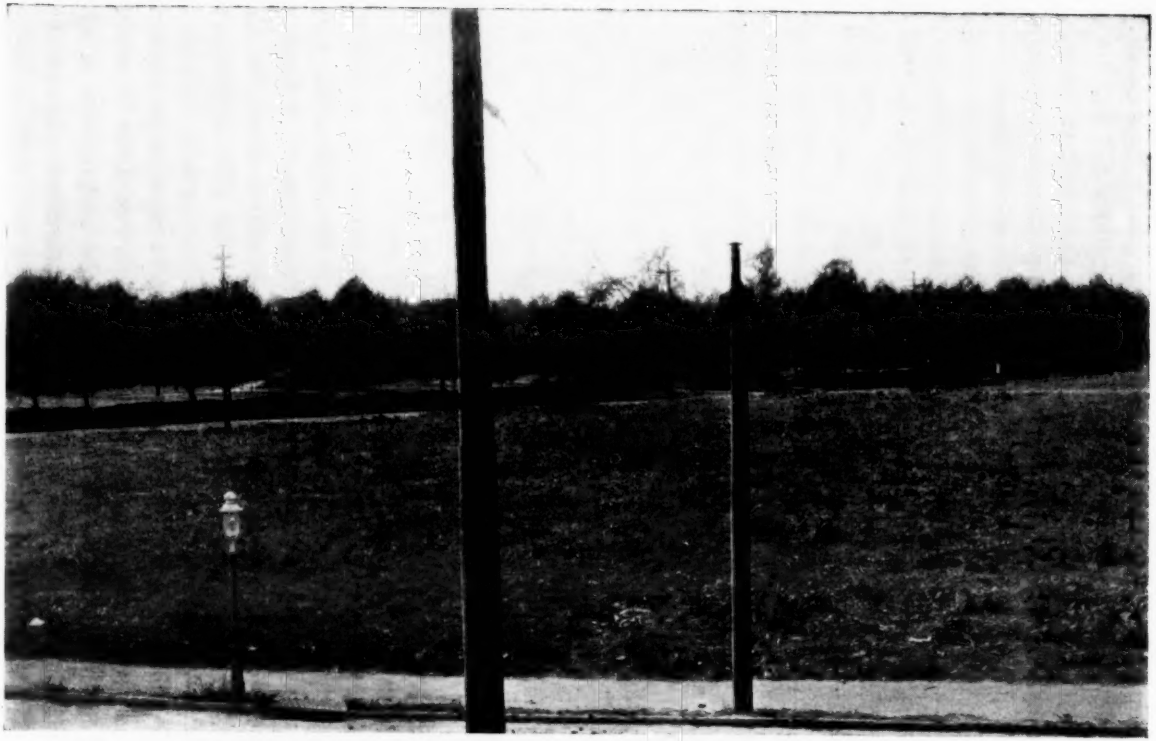
Dr. Luckhardt and Mr. Carter recently thought it worth while to test the gas as an anæsthetic. It was tried first on numerous animals such as frogs, mice, guinea-pigs, rabbits and kittens, who were all put to sleep by it successfully without any apparent after effects of a disagreeable sort. Before testing it on men, the anæsthetic was finally "tried on the dog" who went out completely in less than five minutes on a mixture of 90 per cent. ethylene and 10 per cent. oxygen, and who was up wagging his tail happily three minutes after the gas had been turned off.

The experimenters then tried it on themselves. They describe the effect of the gas mixed with oxygen as exhilarating and giving a sense of well-being. They became unconscious and then subsequently recovered without realization that they had been unconscious. Several students then volunteered. Complete surgical anesthesia with muscular relaxation was produced in a few minutes. Subjects had pins thrust through their arms, were pinched severely enough to leave black and blue areas, and one was beaten on the soles of his feet with a Stillson wrench without any sensation whatever or memory of discomfort.

Recovery was complete in a few minutes. The only after effect was a slight weakness and nausea. In every case the subject ate a full meal within a few hours after recovery.

It is claimed that the new anæsthetic gives loss of sensation long before complete surgical anæsthesia is established, that it may be maintained with complete muscular relaxation yet without any sign of asphyxia, shortness of breath, or effect upon the blood pressure; and that there is rapid recovery even after long administration without evidence of after effects.

It is also stated that it would seem to be of value in obstetrical cases as a loss of any sensation of pain is had from a relatively dilute mixture of the gas, and that it may be used in cases in which nitrous oxide or laughing gas would be dangerous.—*Science Service.*



"For it has been determined that here shall be builded an institution devoted to the services of all mankind."

DEDICATORY EXERCISES AT THE NEW SITE OF THE PHILADELPHIA COLLEGE OF PHARMACY AND SCIENCE.

On a morning, chill and biting, such, perhaps, as that morning a hundred years ago, when a dozen public-spirited apothecaries of the good City of Philadelphia, foregathered in Carpenters' Hall to lay the plans for the establishment of the College of Apothecaries—which came to be the greatest of all colleges of pharmacy—such a morning was that of February 23, 1923, when the new site for the greater college was dedicated and consecrated to a great and worthy purpose. The exercise was conducted on the open field, with dignity and pride, consistent with the history of this Quaker institution.

Members of the Faculty, officials of the College, Alumni and friends gathered at the site and participated in the brief, impressive program outlined herewith.

At the close of the ceremony, Alumni from scattered parts of the country gathered at the festive board at the Bellevue-Stratford to listen to the results of the Expansion Campaign and the plans for further institutional development. The program of the Exercises bore the following expressions of faith and good will:

DEDICATION.

"Here where we now stand will arise a great educational institution, extensive in its scope, nation-wide in its sphere of influence, and consecrated to the training of workers in pharmacy and in the diverse fields of science which have bearing upon human well-being. Here, also, will be carried on researches through which—it is hoped—all humanity may profit.

American Pharmacy was cradled in Philadelphia, and by the men who founded the College which is to be transplanted to this ground. They and their successors, through the hundred years which have since passed, wrought faithfully—humbly—yet with no small measure of success, and their work gave inspiration to thousands who in their turn have rendered service. This record, which is the glory of the College, is our precious inheritance, but also an incentive to carry forward the work, for only in so doing may we conserve our legacy.

Weapons with which disease may be combatted successfully, constitute a primal human necessity—like food and shelter—and as long as illness and pain are the common experiences of life, so long will continue the quest for remedial agencies. True, time and again, medicine has followed some *ignis fatuus* which led nowhere, and the pages of history are strewn with the records of researches which were futile, and of experiments which were failures. But there have been also marvelous discoveries. Indeed, we know that the advances made in the prevention of disease, in the methods of treatment, and in the improvement of remedies, have made possible the alleviation of much suffering, and have lengthened the average span of life.

The re-building and expansion of an institution such as the Philadelphia College of Pharmacy and Science is, therefore, a matter of more than local interest. Nor is this interest confined to Pharmacy or to Medicine, but touches all the people, as all are subject to human ills. So we have met on this anniversary of the founding of the College, to consecrate ourselves and all the resources of the institution to the broad service of humanity, and to solemnly dedicate to such purposes this site, for it has been determined that here shall be builded an institution devoted to the services of all mankind."

From dedication address by

WILLIAM C. BRAISTED, *President.*

"High ideals brought into being this pioneer institution when our nation was young. Great men within its halls of learning have fostered the development and spread of pharmaceutical knowledge. To these ideals which serve as a beacon light, to these men who have left their impress on all time, American Pharmacy owes its most profound debt of gratitude. It is, therefore, with exultant pride, it is with a knowledge of greater benefactions to come, that we see this greatest of landmarks in the domain of scientific pharmacy, engage in a still greater sphere to cover American Pharmacy with glory in the future as it has in the past."

J. A. KOCH, Ph. D.,
President, American Pharmaceutical Association,
Dean, Pittsburgh College of Pharmacy.

"The Mayor is pleased to note the development and expansion movement of the Philadelphia College of Pharmacy and Science. For a full century this honorable Philadelphia institution has been rendering useful service to mankind. It has outgrown its quarters, which are no longer suited to its purposes, and is very properly proceeding to erect buildings more suited to the great work it has to do. Its trained men and women have gone into all parts of the world to minister to the suffering, and its capacity for continuing to so care for its great constituency is worthy of the encouragement and support of good citizens."

J. HAMPTON MOORE,
Mayor, Philadelphia.

"I have a deep interest in the success of an institution which did so much in the pioneer days toward the development of the field of pharmacy, and which is one of the outstanding institutions in the field of higher education, influencing the whole country in the advanced scientific work which it is doing."

THOS. E. FINEGAN, Ph D.,
Superintendent of Education, State of Pennsylvania.

"The Philadelphia College of Pharmacy and Science which has just closed its first century, so rich in its past history of work accomplished, now steps forward into a New Century with renewed vigor and determination toward higher scientific ideals. The reorganization and rehabilitation of the college, as inaugurated by President Braisted, the Board of Trustees and Faculty, is highly commendatory and will result in the abolishment of cheap commercialism and will bring together the chemist and physician in a closer co-operative relationship.

The College is to be congratulated upon its broad scientific program with special reference being given to the establishment of Post Graduate Research Laboratories and also the provision for the standardization of drugs. The college with its increased standards toward

scientific expansion now stands as one of the strong co-operative agencies in public health work."

C. LINCOLN FURBUSH, M. D.,
Director of the Department of Public Health, Philadelphia, Pa.

"The magnificent institution which is to be developed will act as an inspiration to young men and women to seek the highest standards of their profession. They cannot but feel impelled to devote themselves whole-heartedly to the scientific side of pharmacy, thereby making possible the production of surer and safer remedies for the cure and prevention of disease."

DAVID RIESMAN, M. D.,
President, Philadelphia County Medical Society.

THE PRAYER.

REV. JOHN ELLERY TUTTLE, D. D., Litt. D.

Almighty God, our heavenly Father, Fountain of all knowledge and Father of lights, we give Thee hearty thanks and praise that Thou hast guided in wisdom and blessed with success the labors of these whose desire and purpose it is to build and endow an institution of learning where men and women may discover and learn to use for their day and the world the healing properties in the things which Thou hast made.

We thank Thee for the devotion to this end of officials, teachers, students and friends.

We beseech Thee to accept the offering of devotion now made in this enlarged institution. Bless it to the healing of disease, the alleviation of pain, the enrichment of knowledge. Lead all who direct the administration of the affairs of this institution, all who teach, all who study, in earnest and fruitful service, that from them, by the increase of knowledge and wisdom, Thy Truth may be confirmed, Thy glory manifested; and to Thee, for the achievements of the past and the hope of the future, shall be all the praise, world without end. Amen.

NEWS ITEMS AND PERSONAL NOTES

DR. PITTENGER LECTURES AT WESTERN RESERVE UNIVERSITY.—In a lecture, given February 13, 1923, under the auspices of the Pharmacy Department of Western Reserve University, Cleveland, it was demonstrated how the value of some drugs can be weighed more accurately by goldfish, frogs, roosters and dogs than they can by the most sensitive chemical balance.

The lecture was delivered by Dr. Paul S. Pittenger, Pharmacologist for H. K. Mulford Company, Philadelphia, who explained and showed a number of the methods employed in the Mulford Laboratories for standardizing pharmaceutical products.

The lecture brought out the fact that many of the most useful and poisonous drugs vary considerably in their activity and still they cannot be tested by chemical methods.

Apparatus and methods were demonstrated by which these drugs can be accurately standardized and adjusted to a definite strength by the use of animals.

For example, digitalis can be accurately standardized and adjusted to a definite strength by the use of guinea pigs, frogs and goldfish.

Dr. Pittenger demonstrated how a dog can weigh the ten millionth part of an ounce of epinephrine, a guinea pig the ten thousandth of an ounce of pituitary extract and a rooster the thousandth of an ounce of ergot.

Without the use of such methods there is uncertainty and some of our most important remedies may be of proper strength, or they may be over-toxic, or useless.

The methods described, therefore, represent one of the most important advances in present-day medicine, in that they make it possible to standardize these drugs to a uniform strength, so that they become instruments of precision in the hands of physicians in fighting diseases in man and animals.

Dr. Pittenger is also Professor of Biologic Assaying at the Philadelphia College of Pharmacy and Science and at Temple University, as well as a member of the U. S. Pharmacopœial Revision Committee.

TEN THOUSAND MEXICAN DRUG STORES.—At present it is reported they deal more largely in French medicines than American on account of the fact that Mexican medical schools follow French practice. There are possibly ten thousand drug stores in all Mexico, says Consul Thomas D. Bowman in a report to the Department of Commerce. Dealers state that there is a preference for French medicinal products. Mexican medical schools follow French practice and use many French textbooks, with the result that native doctors develop a familiarity with French products and prescribe them.

The heavy Mexican customs duty makes it necessary to sell imported medicines at 50 to 100 per cent. higher than in the United States. The American practice of stating the price of a preparation upon the container (which Europeans do not do) causes the dealer much annoyance in trying to explain why he charges a much higher price.

BOOK REVIEWS

CHEMICALS AND INDUSTRIAL MATERIALS WITH THEIR COMMERCIAL USES. By Charles Argles. 12 x 21 cm. Not paged. Published by the author. No date.

The preface says: "In submitting this little work for general approval, I may remark that its compilation has been a matter of no small trouble and difficulty. I have to thank many leading manufacturers and technical chemists for their kind help.

"The uses of raw materials, as applied to various trades, have not (as far as I know) been hitherto published, and it is obvious therefore that the utility of such information will be readily admitted by the Industrial Community.

"I have attempted in these pages to give the Commercial uses (and users) of the principal Chemicals and Industrial Materials, and in a simple non-technical form, alphabetically arranged, so that those interested may have at hand, a useful guide of practical value in the daily development of their business."

The book is divided into three main sections: The first lists the "chemicals" or simple substances used in industry; the second divi-

sion presents the "industrial materials" in which are included raw materials of more complex composition such as tanning agents, drugs, fatty and essential oils, etc., and the third section contains a valuable enumeration of the materials used in various industries classified according to the trade that uses them.

The conception and execution of this work is so excellent that there is little room for adverse criticism in spite of the fact that from its very nature so detailed and comprehensive a publication is peculiarly liable to error. The printing is well done and the choice of type is good. Being an English publication, the orthography is that in vogue in the British Empire, which means the retention of the final "e" on words which Americans usually end with "in."

The reviewer thinks that "turpentine" should have been listed in the second section instead of in the first and that saccharin, salt and nigrosine belong properly in the first section.

The book will be very useful to all dealers in drugs and chemicals and should especially suggest new possibilities for business expansion. In this respect alone it will justify a place in the commercial library of the chemical salesman and industrial promoter.

JAMES F. COUCH.

MICROSCOPICAL EXAMINATION OF FOODS AND DRUGS. By Henry G. Greenish, F. I. C., F. L. S., Professor of Pharmaceutics to the Pharmaceutical Society of Great Britain and in the University of London. Third edition, xx + 386 pp., 209 illustrations. P. Blakiston's Son and Co., Philadelphia, 1923.

This small volume, the third of its kind, has been compiled by an English authority of eminent standing. Like the second edition of the work its subject matter is divided into fifteen sections and two appendices in which the following topics are respectively considered: Starches, hairs and textile fibers, spores and glands, ergot, woods, stems, leaves, flowers, barks, seeds, fruits, rhizomes, roots, adulterants of powdered foods and drugs, general scheme for the examination of powders, reagents of general utility and varieties of cell wall and cell contents and their identification.

This new edition of the "Foods and Drugs" text shows evidences of careful revision. While there occur neither additional pages nor illustrations over those appearing in the author's second

edition, a number of paragraphs have been amended in details, evidently to the end that the work of the student peruser might be made more accurate. Several new methods of procedure have been introduced. Among these might be mentioned that for the disintegration of tissues by maceration with chromic and nitric acids, a process which is far more preferable to Schulze's maceration method, alike in being more readily controlled and in being free from the objectionable chlorine fumes.

The work is neither a text on botany nor one on pharmacognosy. Its whole plan is such as to afford to the student, who has been properly grounded in botany, the instruction necessary to enable him to undertake the examination of vegetable powders. The work can well be called a classic on methods for the microscopical examination of vegetable foods and drugs and can be highly recommended as such to pharmacists, pharmacognocists and drug analysts.

HEBER W. YOUNGKEN.

The well-known firm of Julius Springer, in Berlin, publishers of some of the most important works in pharmacy, such as Hager, Dieterich, Schelenz, etc., and also of the *Pharmazeutische Zeitung,* favored us with the following books for review:

PHARMAZEUTISCHER KALENDER, 1923. Von Ernst Urban. In 3 Parts. $1.60.

Germany is the home of the many "Kalenders," *i. e.,* almanacs, or pocket yearbooks, which, besides a calendar and diary, contain valuable information for the profession or trade. As early as 1860 Hermann Hager, the master of pharmacy, originated the "Pharmazeutische Kalender." During the first nineteen years Hager himself edited this Kalender. Since then such pharmaceutical authorities as Ewald Geissler, Bernhard Fischer, Georg Arends, Arends and Urban, and now Ernst Urban, editor of the *Pharmazeutische Zeitung,* conducted the work.

Up to last year the Kalender consisted of two parts, namely, I. Pharmazeutische Taschenbuch, and II. Pharmazeutische Jahrbuch. With the present year a welcome innovation has been made by separating the contents into three parts.

I. Taschenbuch, bound in cloth, contains the diary, blank note paper and a tabulation of plants which flower and those which should be collected each month. This handy little volume is intended to be carried in the pocket as its name indicates.

II. Handbuch, bound in cloth, consists of three chapters: 1, Legal Decisions in Pharmacy; 2, Information for Prescription Department and Laboratory, and 3, Pharmacy Laws. Chapter two, besides the many tables, contains a mass of very valuable information as can be seen from the following few headings: Rules for Dispensing, Latin, Homœopathic and Alchemistic Abbreviations, Maximum Doses, Newer Remedies, Poisons and Antidotes, Incompatibilities, Disinfection, Removal of Medicine Stains, Berlin Formulary, Photographic Formulas, Specific Gravity, Extract, Ash and Alkaloid Content of Drugs, Dry Residue of Tinctures and Fluidextracts, Physical and Analytical Constants, etc. Truly a *"multum in parvo,"* which can be extremely useful behind the prescription counter and in the laboratory!

III. Addressbuch, bound in paper, contains Statistics, Pharmacy School and Universities and their Faculties, Boards of Pharmacy, Associations, Pharmacies and Pharmacists in Germany, Luxemburg, Holland and Switzerland, Pharmaceutical Journals and Literature and Buyers' Directory and Advertisements.

Among the pharmaceutical journals in the United States the AMERICAN JOURNAL OF PHARMACY is prominently mentioned and we were agreeably surprised to find that the change in the publication of the *Pharmaceutical Era* from monthly to weekly, which only took place at the beginning of the year, is already recorded. Surely a testimony for the proverbial German thoroughness!

Let us hope that the Pharmazeutische Kalender will continue to live and flourish and it will also become better known among pharmacists in the United States.

CHEMIKER-KALENDER, 1923. Von Prof. Dr. Walther Roth, Techn. Hochschule Braunschwig. In 2 Parts. $1.80.

Not quite as old as his brother, the Pharmazeutische Kalender, the Chemiker-Kalender, now in its forty-fourth year, is of equal importance, especially to chemists.

Volume I contains the usual diary and in 528 pages contains such valuable tables as Atomic and Molecular Weights, Properties of Chemicals, Specific Gravity of Solids, Gases and Solutions, Solubilities, Gravimetric, Volumetric, Electrolytic, Gas and Spectroscopic Analysis.

Volume II, in 655 pages, is divided into two parts. 1, Physics and Physical Chemistry, containing chapters on Mathematics, Weights and Measures, Atomic and Molecular Weights, Eudiometry, Barometry, Thermometry, Thermochemistry, Specific Heat, Latent Heat, Optics, Electrochemistry, Colloidchemistry, Radiochemistry, Physiologic Chemistry, etc. 2, Technical-Chemical Methods treating the different branches of the chemical industry as Metals, Sulphur, Nitrogen, Chlorine, Aluminum, Ceramics, Glass, Cement, Explosions, etc.

The Chemiker-Kalender contains in a condensed form, conveniently arranged, much valuable and accurate information and is an ideal laboratory companion for the practical chemist. No matter how many imitations spring up, the Chemiker-Kalender will continue to be the favorite!

ANLEITUNG ZUR PRUEFUNG DER ARZNEIMITTEL. Von Dr. Max Biechele, Apotheker. 14 Edition. 12 mo., 645 pp. Cloth $1.40.

Apotheker Dr. Max Biechele, who died recently, October 14, 1922, is the originator of this book, which is now in its fourteenth edition. Surely a speaking proof of its utilty! The arrangement of the text in two columns, one containing the text, the other showing the result, is a striking one and could be copied with benefit by some of our American works.

The book is an everlasting credit, better than bronze or marble, to the author!

DIE APOTHEKENHELFERIN. EIN LERN- UND NACHSCHLAGEBUCH. Von Dr. Otto Gerke, Apotheker. 8vo. 98 pp. 35 cents.

In Germany, the same as in the United States and other countries, women are gradually breaking their way into pharmacy. The little book before us, now in its second edition, is intended as

a textbook for the woman apprentice or student. It certainly fills that place to perfection and the author can be complimented upon the treatment of the subject.

OTTO RAUBENHEIMER, Ph. M.

APPLIED PHARMACOLOGY. By A. J. Clarke, Professor of Pharmacology in University of London. P. Blakiston's Son & Company, 1923.

This rather unusual little book can in no way be regarded as a textbook or systematic treatise on either pharmacology or therapeutics. Although the avowed "aim of this book is to try and bridge the gap between pharmacology and therapeutics" it impresses one as being rather a series of monographs on pharmacological problems that are of special interest to the author than a systematic consideration of the relations between the scientific study and clinical uses of drugs. This impression is derived not only from the scant consideration, or even complete omission, of drugs of considerable practical importance, but from the relative space given to the subjects that are considered. It seems, for example, rather an unequal balance to devote fifty pages to the pharmacology of the alimentary canal and thirty-three to consideration of the circulatory apparatus.

Little attention is given to materia medica, but at the end of each chapter is a list of some of the preparations of drugs, with their doses, belonging to the group under consideration. These lists make no pretense at completeness, but it is difficult to understand the principle of selection, which one would presume to be of the most important preparations of the group. For example, under the cathartics, the compound infusion of senna is the only preparation of that drug mentioned and although rhubarb itself is listed no preparation of it is given; under the astringents is included kaolin, but no mention is made of alum nor any of the mineral astringents except a brief mention of lead acetate in the text; of the vegetable astringents catechu and kino are apparently the only ones, outside of tannic acid itself, with which the author is acquainted; in the list of expectorants is included potassium iodid, but none of the stimulating expectorants and in the text the only one of the latter men-

tioned is creosote, of which the rather unexpected statement is made that "its action in diminishing bronchial secretion is probably due to its exercising an antiseptic action."

Another uncommon feature is the amount of space given to subjects not usually included in treatises of pharmacology at all, such as the vitamines, radiations, immunity reactions and "products of protein break-down." A chapter on physiological assay is included, the practical usefulness of which may be gauged by the fact that the biological assay of ergot is given fifteen lines and that of digitalis less than one page, while cannabis indica is dismissed with three lines.

Despite these notable lacks in the book there are a number of interesting features; the most striking of these is the evident intimate acquaintance with the most recent results of pharmacological research and the occasional interesting meanderings into pharmacological philosophy. At the end of each chapter is a short bibliography which would be more valuable if it had some relation to the text of the book; few of the experimenters quoted in the text are referred to in the bibliographical lists and few of the authors mentioned in the latter appear in the main part of the book.

H. C. W.